

THE
Natural History
OF
NITRE:
OR, A
Philosophical Discourse
OF THE
*Nature, Generation, Place, and Ar-
tificial Extraction of NITRE,*
WITH ITS
Vertues and Uses.

BY
WILLIAM CLARKE.

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*To the Right Honourable
Sir Thomas Chiche-
ley Knight, Master
General of his Maje-
sties Ordnance.*



Here are no greater Qua-
lifications of a *Patron*
than his *Dignity* and
Knowledge, by which
he is able to *defend* and *love* what
comes under his *Protection*; and
I should seem not to have been
conversant in the World, if I had
not known your *Person* so *Honou-*

The Epistle Dedicatory.

rable and Qualified. To You therefore Honoured Sir, I humbly present this Discourse, which, if I had done otherwise, and having (with other Authors) the Priviledge of Choice, I should have been censur'd for Ignorance and Neglect. I must confess, it is Presumption to shelter my self under your Patronage; but it is my Interest, which, as it hath so great a power in most other Persons and Actions, it hath at this time been prevalent over me. And here You are like a Great Commander, who defends that Countrey in which he hath so large a Portion; And You having so great Knowledge of the Subject, and especially as it is used in the Noble Art
of

The Epistle Dedicatory.

of *Artillery*, which also adds one more *honourable Title* to your self; It being very observable, That *Nitre* particularly honours and promotes its *Pyrotechnical Speculators*, so that the Subject may be respected, though not the Author, and your Name may be so influential to this *Discourse*, that it may like the Plant *Genista Spinosa*, be alwaies green and flourishing. But having presumed enough already by this Presentation, I must not pretend more familiarity with You; but, as it is my Duty, take my leave; and subscribe my self,

Your most devoted

SERVANT,

WILLIAM CLARKE.

Land. June 11.

1670.



TO THE
READER.

A *Title is not an Invitation sufficient to the Reading of a Book, which, like other Gifts, without a Ceremony, is rudely proffer'd: and I should be no less unmannerly, than singular, if I did not desire my Readers Acceptance of what is here presented to him; as well as give him an Account of the Subject, and occasion of the Discourse more particularly than by a promising Inscription.*

Nitre, the subject of the following Discourse, is so admirable and various in its Nature and Use, that
most

To the Reader.

most who have known it, seem to have had but a share, and contented with a partial knowledge. Some have known only its Extraction, Figure, and Inflammability: the Galenist the Medicinal Use, the Chymist its Dissolving property, to the Souldier its use in making of Gun-powder, and to Others some Mechanical Uses have been discovered: But by this Discourse the Mechanick may be skill'd in the best of Weapons, or may turn a Chymist or a Galenist, and these may compleat their Philosophical knowledge of its Nature and Properties, and may at any time contemplate its outward form, like the Herbalist his Plant, by artificially extracting it.

And I hope as well to satisfie my

To the Reader.

Reader with the compleat knowledge of the Subject, as to please him with the Novelty of the Discourse; for, I dare affirm, that though this Discourse be new, yet there is little wanting to its perfection, this being not an Essay towards the Discovery of its Nature, but a compleat Natural History of it, which may not be a boasting expression, when we cannot be said to know unless we know that we do know, Cum scire non est tantum per causam scire, sed quod ejus causa sit, according to the Philosopher. So that I have not like Mezereon, Tussilago, and such hasty Plants, which flourish before their leaves, but written that from Reason and Experience almost as much as can be in this Subject: which
makes

To the Reader.

makes me bold to use this Expression, because Books should not like Aristotle's Vertue consist in a Mediocrity; but, like Health, admit of no neutral disposition, and if I have by writing fell into the contrary extreme, the ingenuity of my Reader may supply the Defects, and his Candor pardon my faults; which, as it may be without boldness asked, something being required on his part, so the grant may not be doubted of.

Thus, having supplied a defect in Natural Philosophy, I was not unwilling to submit this Treatise to publick View, supposing it may obtain a favourable censure, though this Vegetation of my Intellect, like the Plant which groweth best in its Native

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To the Reader.

*tive soyl, might have better flourish'd
in the Study & Laboratory in which
it was produced. But in this free
Age of Philosophy, whose Mor-
to is Nullius in verba, and which
is as communicative as knowing, if
I may pretend to know any thing,
and not disclose it, I should seem to
degenerate into that envious Vege-
table Tragopogon, which closeth
its flower at Noon: neither have we
only Learned and Honourable Ex-
amples for our Imitation, (& sem-
per ego auditor tantum,) but such
Royal Associates, who may com-
mand the discovery of the most se-
cret knowledge, which, like the An-
timonial Cup, loseth nothing by
communication; though this may
make little return to the Author;*

con-

To the Reader.

contented to be read. Philosophy, being a Liberal Science, as it is not studied for, so it doth as seldome receive a Reward, neither is it only Liberal in respect of its end, being not Lucrum or Gain, but the satisfying and adorning the Mind with Knowledge, but in its free communication. Yet those Persons to whom our Studies and Experiments are dedicated, not seldome prove our Patrons, no otherwise than the Loadstone which is preserved and nourished by the Steel to which it yields its Magnetick Vertue.

Having thus declared the subject of what is here presented, to take of that suspition and slight which usually belongs to what is unknown, It may be as necessary to the following

To the Reader.

ing Discourse, as Methodical to reduce it to its Place in Philosophy to which it belongs.

This Subject of Nitre being a Species of a Natural Body, belongeth to that part of Speculative Philosophy which is called Philosophia Naturalis, or, Natural Philosophy. The Dignity of which Science equalling the great Pleasure and Profit which accompanieth it, hath made it so much studied and improved by its Contemplators no less Honourable than Learned: And especially in our Kingdom, which now may be called Happy, having obtained the Wish of Divine Plato, Where Princes are Philosophers, and Philosophers Princes.

And

To the Reader.

And that the Summ of Nature, which is so various in its Species, and numerous in its Individuals, might, as in a Physical Map, be viewed, it is divided by the Peripateticks into two parts, viz. General and Particular: The former considering Corpus Naturale, or a Natural Body in general, its causes and affections: The later its various kinds, of which Nitre is one, and is therefore placed in this second part of Natural Philosophy, and therein amongst the Minerals, in the Number of which our Subject is reckoned, whose Nature and Properties from Practical Logick, or Reason and Experience is declared in the following Discourse.

*Having thus long detained my
Reader*

To the Reader.

Reader in the Preface, I shall only before I take my leave, Apologize for the Language.

This being a Subject in Natural Philosophy, it should have been written in Latin, the more Learned and Universal Language, which Prerogative it will deservedly retain with its Roman Monarchy. But we are not without Examples in this kind, as worthy Imitation, as Noble and Learned, who have adorned and improved the English Tongue with Philosophy, as well as with Oratory, Poetry, and other Subjects; and in which we do no less Imitate the Antient Learned Romans as well as Grecians, who wrote in their Native Language.

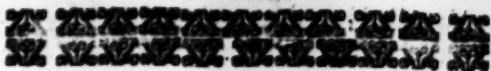
*But the meanness of my Stile may
not*

To the Reader.

not a little detract from the Readers pleasure, for which I hope the Subject will plead my excuse, which requires not so much perswasion, the End of Rhetorick, as Demonstration the End of Science; and the Novelty and Usefulness of this Natural History of Nitre may alone promote its Study and Practice.

But if my Reader fail both of Pleasure and Profit, I have not been prodigal of his time in the brevity of this Discourse, which I entreat may be as candidly accepted, as freely proposed.

T H E



OF THE
N A M E
 AND
N A T U R E
 OF
 NITRE.

CHAP. I.

THings being known and distinguished by their Names as well as Natures, we shall Grammatically explain the Names of *Nitre* before we Logically describe its Nature.

Nitrum, Νίτρον gr. or *Nitre*, is also called *Sal-nitri*, or *Salt-nitre*, from its likeness to Salt, and *Sal-petra*, or *Salt-petre*, from its shooting on walls, which is thus characterised ☉ by the Chymists, and is

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also

also called by other various and ænigmatical names, which shall be set down with their Interpretations, as they more conveniently offer themselves in other places of this Discourse, *sed nominet, quo quisq; vocabulo velit, modo de re constet inter nos*, saith G. Agricola, It is no matter by what name it is called, so we agree about the thing, which is next to be defined.

The Peripatetical Definition of Nitre.

Nitre is generally called a Salt, of which it is accounted a species; G. Agricola calls it a *concrete Juice*, which he likewise puts for a Genus to Salt, Allum, and Vitriol, which are all dissoluble in water; and we may without more logical nicety, only adding the word *mineral*, admit of either Genus.

And to compleat our Definition, we must add its Difference; but because we are so ignorant of the essential forms of things, especially of substances (the right understanding of which, as one expresseth himself, may justly be said to transcend
the

the Zenith of the most raised capacity, and to be placed in a *terra incognita* to the best travell'd of humane understandings) we must therefore substitute its *proper Accidents*, which flow from their substantial form, and are reciprocal with it, by which it shall be sufficiently described. The Logician thus imitating the Physitian in dispensing the famous *Theriaca*, who rather than be without so excellent a Medicine for want of a few Ingredients, hath his *Succedanea* to supply their room, and the Antidote rendred no less effectual.

These *properties* of *Nitre* are its *Figure*, *Taste*, and *Inflammability*; we shall refer its *first* and *second Qualities* to its *Vertues* and *Use*.

1. The figure of *Nitre* is *long* like *Needles*, which may be ocularly demonstrated by dissolving some *Nitre* in water, and boyling it away till it will shoot, then pour it into a wooden dish, and set it in a cool place, and you will perceive, as it cooleth, to shoot in *Stirias*, or long, small figures like *Needles*, to which Philosophers most usually resemble it, and accordingly ex-

(4)

press themselves; which, when it hath all shot, pour off the water, and you will see the Crystallisations condens'd together at the sides and bottom of the dish in large figures, but long, and very white, the form of which you may then exactly consider.

2. It hath a *salt, sharp, and cooling* taste, it is very hard to express the taste, but by the sense it self; and therefore, as I would have the figure observed by the *αὐτοψία*, according to the former practical method, so, I would have the taste experimented by the sense it self, by which it will be perceived different from any thing which resembleth it.

3. It is *Inflammable*, which is experimented by putting a little in the fire, it immediately takes flame and burns, leaving little *calx* or ashes behind it; which fire hath these properties.

1. That it burns with *speed, and vehemency*, not so gradually or mildly as other substances.

2. It burneth *downwards*, contrary to others, which ascend; which may be worth

worth our observing, by putting about the quantity of an ounce in a fire-shovel, and a live coal upon it; when it is all burned, the fire-shovel in the bottom will be red-hot, and burn through whatsoever is under it: if you put it in like manner on a Board, Brick, or Stone, it burns in them a hole proportionable to the quantity burnt.

3. We may also take notice of the *clearness* and *brightness* of its flame, dispersing it self into beams like the Sun in its greatest splendor, and is probably by *Sendivogius* called the *Central Sun*: there doth also proceed a great *noise*, *smoak*, and *smell* from it, which is very observable; and from this burning quality it is said to be a *water which containeth fire*, by Sir *Kenelm Digby*.

But these properties being demonstrable, the mind of a Philosopher cannot rest with the knowledge of the *quod sit* of them, without the *quid sit*, *cum scire*, according to the Philosopher, *est per causam scire*, as he would not vainly attempt what is indemonstrable, so, what is capable of Logical Demonstration, he would not neg-

lect; and this being so difficult to perform, not only in this, but in other subjects of Natural Philosophy, it is called but a *probable Science*; and perhaps I might have passed without this question, had I not proposed it my self. But it is already answered, if I say they are demonstrated by their form, from which they flow, and in the room of which they stand in our definition, and are reciprocal with their subject; and as it is Peripatetical, so it is no less Philosophical; for these properties are so peculiar to their subject, that they can flow from nothing else but their specific form; and what other reasons may be given which I have read or thought of, may be too subtil to hold, and what validity they have, 'tis only as they are reducible to this; and it may but more betray our ignorance to mention them; neither doth it less become a Philosopher than the vulgar, to propose the nature of the thing for the cause, till we can give a nearer, and such a one in which *animus quiescat*.

3. But it is the quality of a good definition not only to declare it self so as to be known,

known, but also distinguished from all other like, as I might particularise in this Example, how that these qualities are *propria quarto modo, quae conveniunt omni, soli, & semper*, which if they are experimentally known, the most exact Boranick cannot more certainly know, or nicely distinguish between the leaves of *wild Campion* and *Scabious*, or *Scorfonera* and *Tragopogon*, or other Herbs which so much resemble one another; the experienced Druggist shall not more accurately discover a sophisticated Drug from a real, than our *Nitrarian* may distinguish between *Nitre* and *Salt*, *Allum* and *Vitriol*, which are so like one to another, and may be mistaken by a superficial observer: But I shall only shew the differences between *Nitre* and *Salt*, that by this comparison it may better be understood.

Though *Salt* agreeth with *Nitre* in the *Genus*, that it is a mineral salt, or concrete juice, yet they differ so in their properties, that they seem contrary one to another: For, 1. *Nitre* shoots long in Needles, but *Salt* shoots in *tesseras*, or squares. 2. *Salt* hath

hath the same taste with its name, and is hot and fiery, contrary to *Nitre*, which is very cooling. 3. It is as contrary also in its burning; *Salt* (like *Gold*) being incombustible, but *Nitre* totally inflammable.

The Chymical Analysis of Nitre.

But the Chymical sect having as great a Name in Philosophy, as Physick, we should seem to betray our ignorance, and not satisfy this inquisitive Age, if we did not, before we leave this subject, consider what Chymistry will add to our Peripatetical Philosophy; and if we can by the Spagyricall Analysis more perfectly discover the Nature of *Nitre*.

If then according to the Chymical Art we proceed with it by *calcination*, it being, if refined, and no salt mixt with it, so inflammable, that it burneth almost all away, leaving little *calx* or ashes; the Chymist hath little left to operate on, and may as much complain as of his Mercury; it is so volatile, that little can proceed from it, but smoke.

But

But, if it be according to Art *distill'd in a Retort*, mixt with Potters earth, the *flegm* will come first, and in small quantity, and also with a little *spirit*, which will appear in the Recipient in form of a *white vapour*, a little after the pure *spirit* will come, appearing in form of *red vapours* which will make the recipient bright, and red as a Ruby, which spirit is called the *Flying Dragon*, which in quality is very corrosive, vaporous, and stinking, like *Aqua-fortis*. And thus, as it hath gained another form, so new qualities, what before would shoot in mathematically formed long figures, hath lost all its shape, and is either a *caput mortuum*, or a fluid substance, beholding to the Vessel which contains it for its form; what before had no unpleasant, saltish, sharp, and cooling taste, is now burning and corroding, not to be touched by a tender tongue, unless of a metallick substance; neither is it so inflammable; thus it is devested of its former habits, and hath assumed new; and if it were capable to be guilty of some great crime, as murder, of which too of-

ten it is, and also as lyable to punishment, it might but assume this chymical form, and it would pass undiscovered, and need not fear to be found out : It being not to be reduc'd to its former shape, being thus rendered incapable of Redintegration; but the contrary would be a pleasant experiment, if by a re-union of those parts thus by distillation separated, the same body could again be re-produced. But, as we cannot make by Art a natural body of new Materials, for which vain attempt *Prometheus* is become a Proverb to this very day ; so, neither can we conjoyn the same Materials violently separated to become the same body, and have the same natural principle of motion, which is to be performed in works of Art, but not of Nature, but by the Author of Nature ; our highest attainment being only to know the reasons of their properties, but not the art of their composition : and here the saying may be verified of the Chymist, that *he pulls down, but doth not build up* ; and it hath not only thus altered its shape, but vertues and use to, this being no feign'd metamorphosis.

What

What before had the honour to be a Medicine, and might have gloried in the title of $\chiειρ θεων$, a hand of the gods, is now rather an instrument in their preparations; and it may be doubted whether it is exalted or degraded; for, what before was capable of liberty, is now confin'd in vessels as a prisoner, and like a slave condemn'd to the Mines, hath not an unlike office, in being chiefly imploy'd as a *Mensstruum* or Dissolvent for Mettals, as will appear when we come to the use of *Nitre* in Chymistry.

Thus we have Peripatetically and Chymically discours'd of the nature of *Nitre*, both as it appeareth in its natural form, and by the artificial separation of its parts by distillation.

But before we conclude this Chapter, we cannot but take notice of a Question, which hath exercised the Wits of many Philosophers, who would be so accurate in their knowledge, and so conveniently offering it self in this place, cannot silently be pass'd by, *viz.*

whether

*whether this Nitre is the same with the Nitre
of the Antients?*

This would not be a question, were it only affirmed on one part, and there hath not been improbable Arguments on either side; for none, as may be supposed, would hold an opinion without Reason. But when *duo contradictoria non possint esse simul vera*, when this Nitre cannot be the same with the antient Nitre, and differ from it, if we may be thought fit to decide the Controversie, we affirm the Question; and though we dissent from some learned Philosophers, as *Matthiolus*, *Bellonius*, &c. yet there are others as learned, with whom we agree, as *Cardanus*, and *Casimirus Siemienowicz Eques Lithuanus*, author *artis Magnæ Artilleriæ*, &c. and particularly also may be mention'd the Ingenious Mr. *Henshaw*, who hath learnedly proved this Assertion to the Royal Society.

But not to prove this opinion only by Authority but Reason, we affirm this to be
the

the same from the Name ; for without doubt the thing is yet in being, and this which we have described bearing its Name, may not unjustly challenge its Nature ; and that this was known to the Antients (as we affirm their *Nitre* is to us) the testimony of *Pliny* plainly evinceth, as the Learned forementioned Author of the *Ars magna Artilleriæ* observeth, viz. *Aperte enim salem hunc, qui in cavernis sua sponte in rupium superficies erumpebat, florem & spumam nitri, salemq; petrosam vel petra nominat* ; but the Antients seem not to observe this $\alpha\pi\epsilon\phi\alpha\iota\tau\epsilon\sigma\alpha\iota$ or efflorescence of *Nitre* on walls, and in houses on floors, as we do, they having it in open fields, which we have not, neither was it so much in use with them as 'tis now ; and this gave occasion of this new name of *Sal-petra* to be given to the old *Nitre*. And though by *Pliny's* and other Antient Authors descriptions of *Nitre* compared with ours, they may seem to differ, it may not be a real difference, but only in degrees of purity, as we see the like in sugar and salt, which by artificial refining are made one and the same,

same : and as it beareth the same name, so it hath the same qualities and vertues, and was anciently in use both to Galenists and Chymists. But it cannot be denied that this *Pyrotechnical Salt* is new as to its use, though not thing; for those Historians, who either praise or dispraise the Inventor of Gun-powder, do it not because he had found out a new species of *Nitre* for the destruction of mankind, but that he had found out a new composition of Gun-powder made of that *Nitre*, which was well known before, and of sulphur and charcoale, and a Gun which they called *Bombarda*, and had taught the Art of making & using them; and it may be granted, that before the invention of this *Nitro-sulphureous* powder, there was little or no use of *Nitre* in their artificial fire-works, or else, as may be supposed, was known but to few, and kept as a secret, according to the fore-quoted Author, who doth also wonder that the old Romans (not to mention the Grecians and Carthaginians) who were the most skilful in the Art of War, and who conquer'd so many Towns, Cities,

ties, and Castles by fire as well as sword, that the Masters of these artificial fires, which were made of oyl of Naphta, Sulphur, Bitumen, Pitch, Rosin, &c. used not, or knew not *salt-Nitre*, which far surpasseth all the rest, and is not mentioned in their compositions. But whether this be the same or no, as this is the only *Nitre* known, so there is none other used, and we need not make any more question about it.

Thus, having briefly describ'd our subject, as to its matter and form, by which it is so characterised, that it cannot but be known, we shall proceed to the efficient cause of its Generation and place in which it is, and having shewn its artificial extraction, without which it would be but a hidden treasure, we shall adde its final cause, for what End and Use Nature hath lodged so excellent a Mineral in the Earth.

CHAP. II.

*Of the Generation and
Place of Nitre.*

THE Generation of Natural Bodies is done in secret, which may seem to be not only for the preserving of heat, being a chief instrument in natural productions, but that so sublime and curious a Myserie might not vulgarly be prostituted, but to her most intellectual Observers, who by the Eye of Reason can investigate, what cannot be discovered by the outward sense. Hence the manner of the Generation of Minerals, Vegetables, and Animals are as obscure, and hid, as the dark subterraneous Mines, the impervious earthly Vegetable, and female animal Matrix, being the places of their formation. Which hath caused those Inquiries the searchers of Nature have made into these secrets. They have endeavoured to see the
Gene-

Generation of a Plant, by putting it into the transparent Element of Water. How curiously have many Philosophers watched the hatching of an Egg, that for all the inclosure of the sperm in the shell, and covered with the hen, it should not be kept secret. Yet some Chymists pretend to know the Generation of Mettals so well, that they can both imitate and perfect Nature in her Mineral Operations. The Works of Art as well as Nature, are kept as obscure in their making. The laborious Bee makes the Fabrick of her Combs in the Dark, and within them the Quintessence of her honey. The Silk-worm works within her Web. The Physitians Experiments are privately dispenced, which, though freely communicated in their Use, yet are more concealed in their preparations: So that we know the things themselves, but not the manner of their productions. No less obscure is Nitre in its Birth, and as difficult to be explained. But we cannot better adhere to any opinion, than to that of our later Philosophers, viz. not that it is a sole mixture of the Ele-

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ments,

ments, but that *Nitre*, with other Minerals, in the beginning of the World, was first *created* in the Earth; and by the power given to it from the Creator, hath preserv'd and *multiply'd* it self. And so from the Creation, not only the formation of its own body, but its propagation and perpetuation proceeds. Now, that the form of Minerals is multiplicative of it self in a dispos'd matter, and proper place, is particularly proved in *Nitre* it self. For, although it be extracted out of *Nitrous* Earth, yet out of the *Mater Nitri, vel Petra*, the seminary principle remaining in the Earth, there is more generated and encreased, and that not once, but often; as is well known to the vulgar Extractors of it.

The Place of Nitre.

A Person famous for any Art or Science discours'd of, his Place of habitation is presently enquired after. The Relation of a Plant of an healing Vertue, is not seldom interrupted with an Inquiry after its place of growth. And, that Chymist
which

which should be ignorant of the ground in which *Nitre* is, and yet his chief agent in his operations, would be as culpable, as that Galenist, who prescribes such Plants, of whose form and place of growth he is too often ignorant of; The Artillery-man hath recourse to this place, as to his Magazine, from whence he is furnish'd with the best of Weapons: therefore, to prevent a question, as well as to perform what necessarily belongs to this Discourse, we are next to shew the Place in which *Nitre* is bred, and is resident in.

The Place famous for *Nitre* among the Antients, was chiefly *Aegypt*, where were the *Nitrariae*, or *Nitre*-works. But now *East-India*, which gloryeth as much in this, as in its *Spices*, and *Barbary*, are the chief places; in many parts of which Countreys it is artificially extracted, and transported to us. But it is not there only confined, *Nitrum fert omnis Tellus*. It is an Ubiquitarian, though no place will scarce hold it, being so easily sublim'd into the Air, or dissolv'd in Water, yet there

is no place without it, though it be not openly in all Countreys to be extracted, as in *Asia*, or *Africa*, yet it is in our *Houses*, on *walls*, and in the *Earthen-floors* of *Halls*, *Cellars*, *Butteries*, &c. and other out-houles, as *Barns*, *Stables*, *Pidgeon-houses*, &c. which are capable of breeding, and retaining it, where it is often visibly apparent in its proper figure, and whence it is vulgarly known to be extracted.

And here it may be questioned, whether in *Houses*, on *Walls*, and *Earthen-floors*, *Nitre* may be said to be generated, or separated and drawn from the *Air* by the heat and dryness of the places, which is analogous to the Extraction by decoction: and which opposeth an opinion that the *Parts*, *Urine*, or *Excrements* of *Men*, *Beasts*, or *Fowl*, the droppings of *Wine* or *Beer*, &c. is a material substance of it; for the dryer the places where *Nitre* is are kept, there is more *Nitre*, according to the Experience of its Mechanical Extractors; and therefore in dry *Floors*, under the *Mangers* chiefly in *Stables* they usually dig, and in *Pidgeon-houses*, their dung, as
good

good for nothing, is rejected, as well as of other Animals, and the Earth underneath only used. And what the Excrements or Urine of living creatures add, is not any thing of their substance convertible into *Salt-petre*, but their putrefactive heat; also the heat of the Wine or Beer in Cellars, which have spirits still exhaling from them, especially in the time of their fermentation, and which is encreased by the heat of living Creatures conversant in them; which heat and dryness are adjuvant causes of its Breeding. And it is upon this principle, that the *Pope* in his State, and the *Duke of Bavaria* in his, did first make, and then nourish Mines of *Salt-petre*, whose Roots and Quarries are quite different from other Minerals: for they are under foot in the Earth; and these over our heads in the Air, as *Sir K. Digby* relateth; for our subject may not be of so contemptible a Birth to be produced from such base Originals, though it hath sometimes no better Lodging. Pearls have been found on Dunghills, and the more Barren grounds

not seldome enjoy the Richest Mines.

But *Nitre* is not confined in one Element; it is an Amphibious Creature inhabiting in *Water* as well as *Land*. It will suffer a dissolution in *Water* as well as a condensation in the *Earth*, and remains intire in both Elements. And particularly among the Ancients, the River *Nilus* is famous for *Nitre*, and a *Lake* of *Macedonia*, &c. And many *Springs* and *Baths* are impregnated with this as well as other Minerals, of which we read many Examples in Natural Histories.

And as *Nitre* is sometimes dissolv'd in *Water*, so it is sublim'd into the *Air*, in which it is universally dilated, and is therefore called *Aer Nitrosus*, or *Nitrous Air*, which Epithite is elegantly and truly by our Modern Philosophers given to it. And from hence may be explained, as Sir K. Digby hath observed, the great Aphorism of the Smaragdine Table; *That what is above, is like what is below, the Sun is the Father, the Moon is the Mother, and the Earth is the Matrix, wherein this produst is hatched; and the Air convey'd it thither.*

thither, and this may be that which by the Chymists is ænigmatically called *Hermes his Bird*.

And if the upper Region of the Air be supposed the Element of Fire where Lightning and Thunder is, and other fiery Meteors, of which *Nitre* may be a cause, it hath then his *Residence in the four Elements*, and thus adds more to its own Ver-
tue, by being as Universal in Place as Use.

That the Air is impregnated with *Nitre*, my former supposition proveth, *viz.* that *Nitre* on Walls, and Earthen-floors is attracted out of the Air, and lodg'd there in part, though not wholly; but Lightning and Thunder more than probably declares it; which will occasion the proposing some *Philosophical Speculations concerning the Use of Nitre in the Air*; by which my Reader, as with Musick between the Acts, may be no less recreated and diverted.

Nitre in the Air is not only a Meteor it self, and particularly a cause of Lightning and Thnnder; but is a general cause of Meteors: Moreover, the Air being

impregnated or mix'd with *Nitre*, and drawn by Animals and Vegetables, it doth so alter the Air, that it is more conducing to their Lives and Growth, as is declared in these following Contemplations.

1. *That Nitre is a general cause of Meteors.*

Not to insist on the Doctrine of Meteorologie, which belongs to another place in Natural Philosophy, and is here supposed to be known, our purpose is only to shew, that *Nitre* being sublim'd into the Air by a fermenting subterranean, and celestial heat, or by a heat in the Earth, and Sun, may dissolve all other vapours and fumes, the material causes of all Meteors, which are in like manner elevated. Which sublim'd *Nitrous* vapour may be compar'd to spirit of *Nitre*, and the Air, the place of Meteors, being impregnated with this naturally distill'd *Nitrous* spirit, keepeth all other vapours and fumes in their principles loose, and imperfectly mix'd, so that they again descend dissolv'd in Rain,
and

and other Meteors. Hence we express the Air not only by its heat, or cold, moisture, or dryness; but also by its piercing, or cutting qualities, which are the properties of a Dissolvent. Hence the Chymist makes use of this Natural Dissolvent in making Oyl of *Mirrh*, Oyl of *Tartar per deliquium*, and other preparations by exposing them to the Air. And from hence we may observe, why most things are dissolved and corrupted in the Air, the hardest Metals will suffer a Rust and Dissolution in it. Philosophy is not seldome confirmed, as disproved by Divinity. *Job* seems to assent to this Doctrine, *Chap. 30. Verse 22. Thou liftest me up to the winde; thou caus'st me to ride upon it, and dissolvest my substance*; which is interpreted by what is already said.

2. That Nitre is a material cause of
Lightning and Thunder.

This *Nitrous* spirit may not only be a general cause of Meteors, but particularly a material cause of *Lightning* and *Thunder*

der, which is worth our consideration ; for
 this knowledge of *Nitre*, and its Nature,
 doth add great light to the Peripatetical
 Doctrine of these fiery Meteors, and more
 clearly explicateth the cause of the flame
 and sound : which, as the Learned *Senner-
 tus* discourseth, proceed from *Nitrous* and
Sulphureous Vapours , which *Aristotle* in
 more general terms calleth *hot and dry Ex-
 halations*, which by motion and collision
 united and condensed, in their meeting
 ferment, and are kindled with a great noise
 or thundering ; which doth not proceed
 only from an inclosed matter, and seeking
 a going out, but from the sudden breaking
 of the Air of bodies exploded : which is
 manifest from many Experiments, as from
Gun-powder, which consists of a mixture
 of *Nitre* and *Sulphur*, with some Char-
 coal, which goeth off, being fired, with
 such a flash and noise, imitating *Lightning*
 and *Thunder*, to which it is compared, and
 if this be true, not from similitude, but
 reality ; neither doth common *sulphur* on-
 ly do this being mix'd with *Nitre*, but also
 the *sulphur* of other *Minerals* and *Met-
 als*,

tals, as it appears in the Calcination of *Antimony* with *Nitre*, and from *Aurum fulminans*. But this rational conjecture, that this fiery Meteor is chiefly a *Nitrous* substance, is more confirmed from the *descent of the flame*, which reason I find not observed by any before. The fore-mentioned Learned *Philosopher* and *Physician* saith, that the flame descends obliquely, and from the force by which it is sent out of the Cloud downwards, contrary to the nature of fire which doth ascend: but we perceive that it descends perpendicularly, which it may not from an external force, but its own peculiar Nature, contrary to all other fires, which is one of the chief properties of *Nitre*, as hath been declared in the former Chapter. And for this Reason I have supposed the *Stella cadens*, or *falling Star*, to be a *Nitrous* substance.

Now, here it may be question'd, *why it sometimes Lightneth without Thunder?* Which, according to the former *Author*, proceedeth from the greater quantity of the *Sulphur* with the *Nitre*; but it may happen

happen rather from the *rarity* and *thinness* of the Air. As, we see, the greater opposition the powder hath when as stop'd in a Gun, it goeth off with the greater report, but being fired in the open air, it maketh but a flash, and a more secret noise; and therefore after *Thunder* it generally raineth, the thick Cloud being immediately dissolv'd and broken by the heat and Explosion of the Meteor.

Here also occasion is offered to discourse of the *Piercing*, *Dissolving*, and *Burning Nature* of *Lightning*; which, though it be so subtile a disquisition, shall be willingly embraced.

There is no Politick or Natural History without many great and wonderful Examples of its Effects, which are so apparent, that few but can witness them from their own knowledge; which therefore we shall not here insert, but only endeavour to give the Reasons of them, referring what else belongs to the History of this fiery Meteor to the Meteorological part of Physicks.

This fiery *Nitrous* or *Nitro-sulphureous Spirit*,

Spirit, is made so penetrating, dissolving, and burning, by this natural sublimation into the third Region of the Air, not to be imitated in a Chymical Laboratory. If spirits be the purer, and consequently stronger, the higher they ascend before they fall into the Receiver; what difference is there between the neck of a Retort, or head of an Alembick, and the distance between the Earth and the third Region of the Air, not to be computed by the Mathematician. And yet this is a true natural spirit distill'd by a terrestrial heat, and attracted, defecated and purified by a celestial; and in this sublimation into the Air, the body of *Nitre* is not only opened, rarified, and exalted in Nature, as well as Place, but still retaineth the same form, but more Spiritual and Vertu-
 al, contrary to the Artificial Distillation, where there is a separation of its constituent parts. So, that this is a preparation of *Nitre*, and yet remains the same Body, which cannot be said of the Chymical. This we know what it is by the going off, noise, smell, and effects. Every illiterate
 person

person talks of Brimstone in *Lightning*, though the other and chief particle of its composition, *Nitre*, hath not been vulgarly observed, but only to the Experimental Philosopher : But the Chymical spirit is not so well known either in its form or qualities, but to the Operator.

And considering the great power and efficacy of Spirits over bodies, we may conceive, That *the Fulmen or Thunderbolt is the same with the Fulgur or Lightning*; and that it is a fiery Nitro-sulphureous spirit, not a stone, as is vulgarly believed; for the wonderful force and power of a *Thunderbolt* cannot be ascribed to a stone, but to a more spiritual and subtile body, or to a more compact Exhalation, like the *corns* of Gun-powder, which is of greater power granulated, suddenly, and with greater force and noise going off, and breaking out of the Clouds. And that which is supposed to be the bolt, may be rather some sand, or whatsoever is apt to flow by fire, and from that melted matter such a stone may be formed, when it is known that Iron and other Mettals have
been

been suddenly melted by *Lightning* and *Thunder*, according to the opinion of *Senertus*.

That the fiery Rain of Brimstone and Fire on Sodom and Gomorrah was Lightning; and that Nitre is expressed by the word Fire.

If we consider the quick devouring nature of *Lightning*, which is manifest from so many fatal Examples of its wonderful Effects, It may not be doubted, but that it was this fiery Meteor, by an Almighty power collected together in great quantity, and shewred down upon these Cities, that burned them to Ashes, as it is recorded by *Moses*, which is the greatest effect as ever was chronicled by any Author, or heard of. And having already affirmed *Lightning* to consist of *Nitrous* and *Sulphureous Vapours inflam'd*, and this *Brimstone* and *Fire* being nothing else but *Brimstone* and *Nitre*, this Assertion may be easily assented to.

For,

For, since I have so perfectly known the Nature of *Nitre*, and especially contemplated on its burning quality, there being not the like fiery substance in the World. I have supposed that in this fiery Rain from Heaven upon *Sodom* and *Gomorrah*, *Gen. Chap. 19. ver. 24, 25.* by *Fire* may be understood *Nitre*: And I consulted the *Critici Sacri*, if I could find such an Interpretation; but they do not interpret the word *Fire* at all, supposing that it might signify only fire in general, not a particular fiery substance. So that *per Sulphur & Ignem*, is only interpreted *Sulphur ignitum, vel Ignem sulphureum*. But, I humbly conceive, if I may be so bold to interpret this place, that *Nitre* is signified by the word *Fire*; which Name is given to it from its fiery quality: and I know not how it may be better proved than by a parallel place, Scripture being the best Interpreter of it self, from *Deut. ch. 29. v. 23.* And that the whole Land thereof is *Brimstone, and Salt, and Burning*, that it is not sown, nor beareth, nor any grass groweth therein, like the overthrow of *Sodom* and *Gomor-*

Gomorrah, Admah and Zeboim, which the Lord overthrew in his Anger, and in his wrath. What before is by *Moses* called *Fire*, is here by the same Author called *Salt*; and by this word *Salt* in this place, no Natural Philosopher can understand any thing but *Nitre*, which is called *Salt*, as its *Genus*, but it cannot be common salt, it being incombustible, nor any other, but this. So that by *Brimstone* and *Salt* may be signified *Brimstone* and *Nitre*. I cannot here detract by silence from the Noble *Polonian* Author fore-quoted, who, in this place understands *Nitre* by this word *Salt*. There is another Text, which may more confirm this supposition; *Pf. II. ver. 6. Upon the wicked he shall rain Snares, Fire, and Brimstone, and an horrible tempest*, or, as it is also translated in the margin, *a burning tempest*. This last expression seemeth to explain the former, *by an horrible or burning tempest* may be understood *Lightning* and *Thunder*, which accompanies tempestuous weather, which is so quick and surprising, like the going off of a Gun, that as a *Snare* it catcheth the

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wicked,

wicked, and *Lots Wife* was only by looking Back, so small a stay, overtaken by this *Artillery of Heaven*, and calcin'd and turned into a *Pillar of Salt*, the only incombustible remains of her Body. Accordingly, *Tacitus* saith, *Hist. 5.* That these Cities burned *fulminum jactu.*

But there are other Arguments to prove this opinion; as,

1. *Brimstone* and *Fire* being mentioned together, it may argue the *Fire* to be some mineral inflammable substance, as well as the other. And we know not what else can be understood, or added to *Brimstone* but *Nitre*; and,

2. It may be more confirmed from the Descension of the *Fire*, which is a Natural property of *Nitre*, and mix'd with *Sulphur*, may cause it to descend, and encrease the fire, and not on the contrary, as a *Critick* observeth, *viz. Sulphur additur igni, quia ignem levem sulphur gravitate sua deorsum pellit.* Which was well understood by *Moses*, who was so great a Philosopher, from whom the historical beginning and progress of Philosophy is deriv'd

riv'd to these times, and who was not only acquainted with the knowledge of the Age he liv'd in, being learned in all the wisdom of the *Egyptians*, but with a more illuminated reason from the Author of Nature, & who begins his own Divine History with the Philosophical Description of the Creation. This *Divine Philosopher* gave these two *Synonyma's* to *Nitre*, calling it *Fire* and *Salt*, or a *Fiery Salt*, being the chief combustible Salt in the World.

This *Fire* and *Brimstone*, which from hence is called *θεῖον*, is *eterni judicii Typus quidam*, or a Type of the eternal Judgment. *Rev. ch. 19. v. 20.* according to a Learned Critick, which is called a lake of *Fire burning with Brimstone*, or a lake of *Fire and Brimstone*, *Rev. ch. 20. v. 10.* which Interpretation seemeth to be confirmed by *St. Jude, v. 7.* who saith, that *Sodom and Gomorrah*, and the Cities about them, suffered the vengeance of eternal fire.

From this Discourse we may observe these two Corollaries.

1. That the knowledge of Nitre was most ancient, some thousand years ago, and not only its Antiquity is more apparent from the sacred Scriptures, than prophane authors; but,

2. That the Nitre of the Antients is the same with ours.

3. The Use of Nitre to Animals and Vegetables.

This subject is as *prolifick* of Reason, as Experiments, & this speculation being new and rational, I fear not to satiate and cloy my Reader with this interposed variety.

1. The life of Animals being a burning Sulphur, consisting in *calido & humido*, which is perceptible to the touch, may be at first kindled (if it may be so expressed) by the *Nitrous* Air receiv'd into the Lungs, and communicated to the heart. And as without Air, which is the life of Fire, this innate animal heat would extinguish: So the Air being *nitrous*, it not only inflames it; but,

2. From

2. From its coolness, it so allaiies and tempers our natural heat, that it doth not too much prey upon our Radical Moisture, and keepeth eur life in its due fermentation. Therefore, according to my Lord Bacon, *Nit* re fixeth the spirits, and conduceth to long life.

3. And moreover, by its dissolving nature it renders the humors of the body more fluid, and so more apt to perform their circulary motions, in which Life consists. Such Airs therefore as are most impregnated with this benigne Fire, are most healthful to live in, according to Sir K. Digby; this gave cause to the *Cosmopolite* to say, there is in the Air an hidden food of life; but of this I have now given my Reader but a rude draught, like the pattern of some curious lace, and must delay till another opportunity, to fill up, and embelliish this unwrought Discourse with a larger Philosophical Explanation.

This *Universal spirit* affords the like use to Vegetables, as to Animals. Without this *Nitrosity*, the *Sulphur*, or Radical humidity of seeds would lye dormant in

the Matrix of their Mother Earth, and not be a nourishment to the Vegetable spirit.

2. And did not this cool *Nitrous* Air interpose the tender bodies of Plants at their first appearance out of the Earth would be scorched up, and withered.

3. And were not the Vegetable juice dissolv'd, it would not be attracted, and pass the insensible pores of the Root and Leaf. And in vain might the *Herbalist* travel Fields, Meadows, Woods, Hills, Valleys, and Waters, which would prove as barren as the sands of *Arabia*, and would more exercise his body than recreate his minde in contemplating the no less pleasant than various forms, colours, smells, and tastes of Plants, with their other Qualities and Vertues, so much tending to their own perfection, as profitable, chiefly to the Lord of the Creation, Man.

It is the opinion of some Philosophers, that *Nitre* is the Vegetable nutritive juice, which I suppose not, neither is *Salt*, which I will not here dispute; But the alimantal
juice

juice of Plants may rather be a kind of Radical moyfture or fatnefs; the Earth from the beginning containing in it felf not only the feeds of Plants, but their alimantal juices, which the Rain diffolves, that they may be capable of attraction, and affimilation, and the Sun and *Nitrous Air* brings their nutritive powers into Act, excites and continues their vegetation.

I might have more largely treated on this fubject, but I would not be tedious, and fhould too much fufpect my Reader by Interpretations; and as in Logick an Argument may be framed in two or three Syllogifms, without multiplying more to hold out time: fo our Phyfical Ratiocinations may be fet down in few words; and what I have here fupposed, is in other places of this Difcourfe proved, that *Nitre* is fermenting, cooling, and diffolving.

CHAP. III.

*Of the Artificial manner
of Extracting and Re-
fining of Nitre.*

NOW we shall proceed to the Artificial manner of Extracting of *Nitre*, which we must not endeavour to extract out of the Air, or Water, but Earth; for, though the former may be possible, yet we may most often take pains to no purpose; neither are we to sail to *India*, or *Barbary* to trye our Experiment, which may be done at home: and that here we may not labour in vain, it will be first necessary to know, whether the ground in such places which we have mentioned be impregnated with *Nitre* or no, which may be thus experimented.

Dig up some of the earth with a knife, and hold it in your hand till it be hot, which

which exerts its quality, and then taste it, if it be good it will prick the tongue, and taste like spice, and knowing the taste of *Nitre*, you may the better judge of the ground, the earth also will thoot and sparkle in the fire. Sometimes it is visibly seen on Walls, in Cellars, and on the Ground, it also appears like an *efflorescence* or ἀφρόνισπος, or *spuma Nitri*, which gave occasion to the Name.

Now knowing the ground in which *Nitre* is, we may proceed to the artifice of its extraction, which is by water and decoction, by the first it is easily dissolved out of the Earth, from whence it is called a *concrete juice*, and by the second it is separated again from the Water. But this general way of expression not sufficiently teaching the manual operation of it, I shall more particularly set down the Process of it, which is this,

First, take a Tub about the bigness of half a Barrel, more or less, fill it with Earth almost full in the morning, then pour on it as much Water as the Tub will hold, and let it stand all day, and at night let it
run

out of the Tap at the bottom, gently, drop by drop. Now it is necessary to put a handful of hay at the Tap, within the Tub before you fill it, that the Earth may not stop its running.

This *raw Liquor* impregnated with *Nitre*, you must boyle over the fire in a little furnace or other Vessel, half away, then you must scour it with Ashes, thus,

Pour this Liquor hot on Ashes in another Tub, a peck of Ashes may be proportion enough for this quantity of Liquor, and 'tis no matter how soon you let it run from the Ashes again.

This *scoured Liquor* you must boyle over the fire again till it comes to *Nitre*, or *Petre*, which, when it is so come to a proof, is known by this Tryal.

Drop some of your Liquor upon a knife, if it stands like a Pearl, and not run off, but congeals into *Petre*, it is come, which you may also know by its smell, which will be very strong, and colour, which will be altered.

When it is thus come, you must pour it off into one or more Vessels of Wood

Wood, or Mettal to shoot in a cool place.

When it is cold, which will be in few hours, you will see the *Nitre* shot in *Needles*, and the *Salt*, if any, at the bottom and top in *Squares*, with which sight you will not be a little delighted. And, I know not in what Experiment I have taken more pleasure, than to see such a *CrySTALLINE substance* taken out of *dirty Earth*, so beautiful a *Body* out of a *Chaos*, such a *Spiritual Essence*, as without a Metaphor almost it may be called, drawn from a *Caput Mortuum*; that no Philosophical Experimentor in its Extraction but will have such thoughts, when the Mechanical Labourers at the work cannot behold it without admiration.

After it is all shot, you must pour off the *Liquor* from it, which is called *Mater Salis-petra* or *Mother of Petre*, and must be scoured again with *Ashes*, and boyled, and set to shoot, and so repeat this operation till you have separated all the *Nitre* from the *Liquor* and *Salt*, which afterwards may be thus Refined.

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The manner of Refining of Nitre.

Put so much water into your Kettle, as you judge will dissolve all your *Nitre*, which you have thus extracted; then boyl it, and skim it, and when it is come to a proof, pour it off into a Vessel, and cover it, that it may not cool too fast, that the *Salt* for the most part may settle, which now will appear in its perfect *square*, and large, and when it begins to shoot, which you may thus know, first put your finger into cold water, and then into the Liquor, and if you feel it prick by the sides, you may pour it off into another Vessel to shoot, which will then be all in a cake, so that its proper figure in this conglomerated Mass will not be so apparent. When it is all shot, which will be in five or six hours time, pour of your *refined Liquor*, and set up your Vessel a draining, and when it is dry, take out your *Cake of Nitre*, and put it in a clean linnen-cloath, and lay it on dry Ashes, which will dry up all the Water out of it.

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The Quantity of *Nitre* which I thus extracted and refined (after many former Experiments seen in great quantities) out of such a proportion of Earth was about three pound. But being it is to be had already refin'd, it is left to any ones choice, whether he will trouble himself with this Experiment or no, and may rest contented with the contemplation of it, as the Learned *Renodeus* saith, a Philosopher may not trouble himself about, not only in this subject, but in *Sulphur*, *Oyle*, &c. which may be left to the Mechanical Extractors, though it may contribute to the better knowledge of the subject, as it did to me. For before, I had but a notion of the thing and its Nature, which by its Extraction, I more experimentally knew. Which before was like an *exotick Medicinal Gum*, known only as to the thing and use, but not the outward form of the Plant it self, place of growth, and artificial separation of the Gum. And the one not being satisfying to those which are studious of a more compleat natural knowledge, hath caused some Philosophers to travel into the

the *Indies*, &c. to know, and communicate the History of the Plants, &c. there, imitating *Galen* himself, who travell'd to *Palestine* for the natural Balsom, and to *Lemnos* for its Earth.

But Faith may sometimes make a Philosopher as well as a Christian. The *Astronomer* may be contented to view the Stars of the Southern Hemisphere in the *Celestial Globe*, without taking more than a years Voyage unto the *South Pole* to see them, as did the Learned *Mathematician* Mr. *Hues*, as he relateth of himself. Neither is it less pleasant and satisfying sometimes to travel in a *Geographical Map*. An *Anatomist* may content himself with a lively Figure of the parts of the Body in *Spigelius*, and the *Herbalist* with the Figure of a Plant in *Hortus Eystettensis*, when they may not have the *αὐτοψία* or ocular inspection in the *Anatomical Theatre*, or *Physick Garden*. *Erasmus* saith of that Learned and Experienced Philosopher and Physitian *Georgius Agricola*, so famous for his Books of Minerals. *Visus sum mihi valles illas & colles, & fodinas, & machinas*

chinas non legere sed spectare : He did not so much read as see those *Valleys, and Hills, Mines, and artificial Extractions* in his Books.

And I hope my Description may be so satisfying, that no *Sculpture* may be more illustrating to the Contemplator, nor error in practise committed by the Experimenter.

Thus, we have not all this while discours'd of an Imaginary thing, but by this artificial Extraction expos'd it to our sight and touch, and nothing now remains, but that we shew the Vertues and Uses of this truly *Natural and Philosophical Extract*.

CHAP. IV.

*Of the Vertues and Uses
of Nitre.*

THE knowledge of the Nature of *Nitre* would be esteemed barren, and the labour in its Extraction vain, if the practical uses did not follow its Philosophical speculation.

It would be a question proposed to *Aristotle*, examining the *Species* and properties of Living creatures, though as well encouraged as commanded by *Alexander*, and *Hunters*, *Fowlers*, *Fishers*, &c. commission'd to bring their sports to his Philosophical scrutiny. The *Philosopher* would be censur'd as unprofitably employ'd, and the will of a *Grecian Monarch* would not be a sufficient reason for his commands, without answering to this question; To what end or use is this hunting of Nature, prying into her Individuals, and anatomizing

sing their parts? It would not be a sufficient Answer of *Dioscorides* to recreate himself in wandring about the fields to contemplate on the variety of Plants, in which particularly Nature is said to play and please her self in her various productions, as well as her Speculators. *Agricola* must give an account of the Vertues of those Minerals, he so Philosophically treated of, with their various artificial Extractions. *Aristotle* therefore declareth the properties of those creatures, and uses of their parts he studied, and anatomised. The Vertues of those Plants *Dioscorides* wrote of, far exceed the number of the *Simples* themselves. Nor doth *Agricola* neglect to set down the Vertues and Uses of those Minerals he so industriously studied. Neither are these singular, but only for their antiquity and excellency first named; but, as their examples have been honourable, so they have been imitated by all succeeding Philosophers. The Ingenuity of the minds of our late Anatomists hath not been inferior to the dexterity of their hands: for, as by their ma-

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nual scrutiny they have not left the most minute or secret wheel of Natures *animal clockwork* undiscovered ; so, neither the uses of the parts they have been so fortunate in the discovery of, are hid and obscured ; as there is no *terra incognita* in the *Microcosm*, so 'tis all improved : the external form of a Plant hath not satisfied the *Herbalist* without examining its Vertue ; which, if it hath not been sufficiently manifested to the outward senses, it hath endured the fiery tryal, which hath made Minerals as well as Vegetables confess all their treasures to the Experimental Philosopher.

And our Labour, if we will imitate these our great Masters, is not yet done, if we declare not the Vertues and Uses of that *Nitre*, which we have hitherto Physically contemplated ; which being so excellent and various, is matter enough for the continuance of our Discourse. For this is a subject not only for contemplation, but practise, and we could hardly forbear till now in the last place to mention them, when this Chapter might have preceded the

the former, for the greater invitation and encouragement to the reading of them. For otherwise the Philosopher would not only be ignorant of one *species* in Mineralogie, but of the reason of many natural *Phainomena*, which by the knowledge of *Nitre* are demonstrated. The *Galenist* would not rest without the knowledge of that Medicine good for so many Diseases, as also the *Chymist* would presently study, and covetously extract that which must be his chief *Menstruum* in his preparations. The *Divine*, without the knowledge of this, would lose one of his *Criticks*. The *Artillery-man* or *Souldier* could not stand his ground, and in comparison, would march unarm'd into the field without these fire-arms, and without it many *Mechanicks* would be undone: its use being so universal and unconfined, both for speculation and practise.

And first we shall shew the *Vertues* and *Use* of *Nitre* in *Medicine*, both *Galenical* and *Chymical*, which Medicinal use followeth the Philosophical Discourse from a natural order; Medicine being a subalter-

nate Art to Philosophy : *Ubi igitur desinit Philosophus, ibi incipit Medicus.*

*The Vertues of Nitre in Galenical
Physick.*

We come now therefore to treat of it as it belongs to the *therapeutical* part of *Physick*, and as it is a *materia medica*, and accordingly its *first* and *second* qualities are to be considered, which in the first *Chapt.* we referr'd to this place.

It is not a little controverted whether *Nitre* be cold or hot, & reasons as probable on both sides, as it hath been disputed concerning *Camphor*, *Opium*, &c. But not to enter into a controversie, but rather decide it, we say, that it is *cooling* in the concrete, not cold in the abstract, and that so sensibly, that it may be placed in the *second degree*, and so whether it be cold or hot, it will confirm our opinion, if the first, *viz.* cold, we need no proof, that it is cooling; if the second, *viz.* hot, it may be cooling *per accidens*, though not *per se*, or in effect, by taking away

away hot humors, and so the body may remain more cool by such an operation. No otherwise than hot Medicines cure burnings, as *Oyle, Onyons, Soap, &c.* and for this seeming mixture of Natures, it hath been called *Sal Androgynus*, or the *Hermaphroditical Salt*: and its nature being so obscure, we would not be more positive in our determination, yet we may undertake to answer on the Question with the former distinction.

Neither is *Nitre* thus singly endowed with the *first*, but also with other *second* and *third qualities*, it being moreover in its nature *resolving, purgative, and diuretical*. It being so compleatly qualified, that there seemeth nothing wanting to its perfection.

And from these properties it is in use by *Physicians*, for those Diseases to which it is appropriated, they being no less diligent in the use of Medicines than in the investigation of their natures. From its *first qualities*, *Nitre* being so great a cooler, it is used in *Fevers*, to extinguish the heat and dryness. From which effect it is cal-

led *Lapis Prunella*, because it is a sovereign remedy against those Fevers which in French are called *Fieures prunelles*, or *Burning Fevers*; and this from the Latin word *pruna*, which signifieth, a live or burning coale, which is the common *Nitre* better prepared and purified, and is not only called so from its vertue *prunella*, but from its preparation, by which it is hardned *lapis*. The preparation of which *Lapis prunella* is after this manner;

Take 1 pound of pure refin'd *Nitre*, put it in a crucible, or other Vessel on a very hot fire, that it may melt and flow like a mettall, then put to it, thus melted, two ounces of flower of Brimstone by little and little, which will immediately take flame and burn, and when it is all consumed, pour off the *Nitre* into a brass Bason, and after it is cold, let it be kept in a glass close stop'd for use.

Now this is the highest purifying of *Nitre* that may be, which excells the refin'd *Nitre*; for if there be any heterogeneous substance, or crude moylture in it, it is thus consumed and evaporated by the flame of the *Sulphur*; which may have
occa-

occasion'd the other name of *Crystallum minerale* to be given to it from its purity. *Medicines*, as well as *Persons*, thus glorying in their *Titles* deservedly and honourably conferr'd on them, the *Physitian* here imitating a *Princely Prerogative* in conferring *Honorary Titles* on his Preparations.

And here we may observe how curious the *Galenist* is in preparing his *Medicines*, though the contrary without cause is too often objected. The best refin'd *Nitre* is not fit for his turn, till he hath by Art thus purified it: but his wisdom also is not a little in resting here, and not proceeding any farther by distilling it into a spirit, its Vertue shewing it self better as it is, and it may seem but a labour in vain, when if it should be so prepared, before he could exhibit it as a *Medicine*, he must reduce it back again into its former state by dilating it in common or simple distill'd water, or such like liquor, that it may not be too corrosive and piercing, it being then a fitter *Menstruum* or *Preparator* of *Medicines*, than a *Medicine* it self.

But, though it be so particularly good for a *Fever*, it is not confin'd only to that in its use, but for the same Reason also its use is more general. For a *Fever* proceeding or accompanying most other *Diseases*, it is also good for them, and from its *second* and *third qualities* it dissolves and carries away by stool and urine hot, sharp, cholerick, and obstructive humors in several parts of the Body, which give names to several *Diseases*, which preternatural humors causing pain, and thus taken away, it is called *Anodynum minerale*.

Neither is its *use* only *internal* but *external*; for the same hot and sharp humors in *waters*, *Oyles*, *Unguents*, or *Powders*, as the Learned Artist pleaseth.

Now here I could particularly set down how *Nitre* was used by the Antient *Galenists*, *Greeks*, *Arabians*, and *Latins*, both *singly*, and in *composition*, *inwardly*, and *outwardly*, and how we vary in our modern practise. But the Philosopher may not so much desire it, and the Physitian may already know it, & *artis est celare artem*, and shall therefore defer it till another opportunity;

portunity, when I promise with what is thought fit now for brevity to be omitted, fully to satisfy my Reader.

Now here I am opposed with a *Dilemma*, whether I shall continue my Discourse, or interpose a Philosophical Question, which ariseth from this preparation of *Lapis Prunellæ*; but to deviate sometimes, is to walk out of a plain path into a flowry Meadow, and I may more consult my Readers pleasure by this Diversion, therefore I shall here propose this Question.

Why in this preparation of Lapis Prunellæ, the Nitre doth not burn, but only dissolve, and boyle in the Crucible?

This being the most inflammable substance in the World, nothing could give a better occasion to the Question. Which, yet is no other than what hath been proposed by many Philosophers in other words; As, *why the bottome of a Pot over the fire, in which the water boyleth, is not red hot?* And there is the same reason

son for this as the other, and it is the same with many other Questions; As, why *Pewter and Leaden Vessels* which are easily melted by the fire, do not melt as long as there is in them water, or any other liquor; neither will *Earthen Vessels* flye, and break? After the same manner *Water or Oyle* may be heated in a paper over the fire, and the paper not burn: and many other such like Questions, which have been thought worthy the Exercise of the wits of many Philosophers. Many of whose opinions on this Question, the Learned *Sennertus* hath collected, and at last gives his own Reason, whom the Reader may please to peruse, and as the others were not satisfactory to him, or a mind desirous of truth, so neither are those, nor his own to me; and therefore I shall give another, which seemeth to me to be the only true, and I hope may be so fully satisfactory, that it may put an end to the Question.

In answer to the Question, I say, that the *Nitre* in the Crucible, or other Vessel, doth only dissolve and boyle, but not take flame and burn, because that the Crucible

or

or Vessel it self cannot be red-hot, and burn, so far as it is fill'd with *Nitre*, so as to kindle the *Nitre*, and the Reason is for want of *Air*: For *Air*, being the life of Fire, the *Nitre* dissolving in the Crucible, or other Vessel, keeps out the *Air*, and so both preserves the Vessel and it self too; so if *Oyle*, &c. should be put on the fire in a Pewter or Leaden Vessel, they would be both hot, but as the Vessel would not melt, so the *Oyle* would not burn, but if you put a live coal into the Crucible, the *Nitre* immediately flameth, because it hath the free *Air*; and so the *Oyle*, if the flame of the fire should touch it at the top of the Vessel, it would likewise take flame, and burn: and on the contrary, these Vessels would be red-hot, crack, and melt, were they put on the fire empty.

This Question puts me in mind, walking in the Ruines of the City after the Fire, on the Gold on many Statues and other places which were gilt, which was not melted, though the stones endur'd the most scorching flames, because it sticking so close, no air could come about it,
that

that unless the stones did burn and melt, the Gold would remain undissolved, but that which one may more wonder at, not knowing the Reason was, that the paper-Bills on the walls in many places where the fire came, where they were paited close, and no hollownes, for there they were burn'd, remain'd like the Gold unburn'd, and endur'd that fiery Tryal. I then observing it, put me in mind of the Question, and I ask'd one which stood by me, whom I took not for a Philosopher, was it not very strange that those paper-Bills on the walls should not be burned? he answered, 'twas very strange that the fire should not touch them, the wall and places all about being burn'd; I answered, the fire touch'd them as vehemently as any other part of the wall, which when he considered, did the more wonder. Thus many other like Questions are truly resolved, and other secrets of Nature understood, which we shall not now mention, lest our variety should be tedious.

But

But yet we cannot proceed, being detained with another Question in this preparation of *Lapis prunellæ*. Why the sulphur which immediately takes flame and burns on the top of the Nitre, doth not inflame the Nitre, no more than the fire underneath? It being not to be kindled by a flame, but a glowing coal, &c. But to answer every Question, might be too Magisterial, and suspicious of the Readers Ingenuity; I shall therefore purposely leave it unresolved, to remain a Philosophical Recreation.

A Philosophical explanation of those places in the Sacred Scriptures, in which Nitre is named.

Natural Philosophy, as well as the other parts of the *Encyclopædia*, doth not a little contribute to the understanding of the *Sacred Scriptures*, as hath been manifested by several Authors, who are deservedly numbred amongst the *Critici Sacri*, who have wrote of the Animals, Vegetables, and Minerals named in them.

And

And in imitation of these Divine Philosophers, having in the Second Chap. interpreted those places in the *Bible* in which *Nitre* seemeth to be understood by the names of *Fire* and *Salt*: we come now to explain those places in which *Nitre* is expressly named.

We read of נִטְרָה *Heb.* or *Nitre* in *Prov.* 25. v. 20. *As he that taketh away a Garment in cold Weather, and as Vineger upon Nitre, so is he that singeth songs to an heavy heart.* *St. Hieronymus, Lyranus, Isidorus, Valesius, &c.* have variously commented on this word *Nitre* in this place, as may be read in *Casius de Mineralibus*. But my Interpretation being different from the fore-quoted Authors, shall be here set down, and which seemeth to be the natural meaning, which is this.

Nitre being of a very cooling, and sharp taste, and *Vineger* being known to be of the same nature; therefore, as *Nitre* is used in *Fevers*, so is *Vineger*; so that one being mix'd with the other, the nature of both is exalted and encreased. By which this *Nitrum acetosum, vel Acetum nitrosum,*
or

or *Nitre dissolved in Vinegar*, is more cool and sharp by this conjunction, as *he that*, on the contrary, *taketh away a Garment in cold weather*, encrease the cold : as it is in the former part of the *Verse*, by which we may understand the later part of the similitude, viz. *so is he that singeth songs to an heavy heart*, that is, he doth but encrease his sorrow by the best *Musick*, which is *Vocal*, expressing words in a melodious *Air*, as proceeding from the best Instrument composed so artificially, though a natural organ, of so many parts for the framing the voice, and playd upon by the animal spirit, the immediate instrument of the *Rational soul*, when all other Instruments of *Musick* may be said to be dead to this lively one; yet this hath a contrary effect to a sorrowful mind. Speech sheweth a man, he not being known so well by his outward *Physiognomie* as *Discourse*, which is set forth the more by the delivery; but, as *Verse*, for mirth, hath the advantage over *Prose*; so, when it is set to a tune, and sung, what *Musick* can be compared to it, either in nature, or effect. Yet this

to a melancholy hearer, is but like the pleasing *Berry* of *Dulcamara* or *Bittersweet* to the palate, which first tasteth sweet, but afterwards turneth bitter. How ineffectual would only good advice or some comfortable expressions be, if a *Song* would but exasperate the Humor. If honey thus breedeth Choler, & Sweetmeats turn into bitter humors. Here *Corruptio optimi est pessima*, a Cordial doth but evaporate the spirits, which should increase them: no otherwise than *Atrabilis ventriculo substrata*, or the melancholy humor it self, which doth but the more ferment and boyl by the best meats, and convert them into its own sour nature, & so increaseth it self; it is dangerous to attempte, much more to purge this black chole-
rick humor, & hence those diseases which proceed from it are so difficultly cured.

We read of *Nitre* also *Fer. Chap. 2. v. 22.* For though thou wash thee with *Nitre*, and take thee much soap, yet thine iniquity is marked before me, saith the Lord God. *Septem sunt species, quæ auferunt maculas apud Talmudicos, inter quas est, נתר, vel Nitrum,*

Nitrum, according to *Buxtorfius*. *Lyranus* commenting on this place saith, *Nitrum*, quo utuntur purgatores vestium, dicitur a niteo quia facit vestes nitidas, and according to *Dr. Jordan*, if *Nitre* be mix'd with earth, it makes it abstergent, like soap, and this scouring faculty of *Nitre* was anciently known, and used in *Bathes*, &c. and is worthy again to be brought into use, its Vertue being admirable for cleansing the skin from such humors which discolour and fret it.

The Use of Nitre in Chymistry.

Thus, having expressed the Vertues of *Nitre* in Galenical Physick, we now come to its Uses in Chymistry, which are no less excellent than various. For, by *Nitre* in Chymistry may be made a pleasant and cooling acid, or a hot and burning corrosive: sometimes it revives the vomitive and purgative vertue of *Antimony*, sometimes it kills the vomitive, and revives only the purgative, and sometimes it destroys both, and quickens either the *Di-*

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retick,

retick, or *Diaphoretick* ; in a word, it produceth so many wonderful effects upon all the other Minerals, that we may justly call it the *Universal Agent in Chymistry*. As the experienc'd Mr. *Thibaut* Chymist to the *French King*, expresseth it.

And after a serious and exact consideration of most Chymical preparations, its Use may be comprehended in this Division, viz. that it *Calcines*, *Sublimes*, and *Dissolves Minerals* and *Mettals*, which we shall in order declare.

I. *The Use of Nitre in Calcination.*

By *Nitre* is calcined *Sulphur virum*, & so prepared according to Art, is called *Nitrum sulphuratum*. Of *Antimony* calcined by *Nitre*, is made *Regulus Antimonii*, *Crocus metallorum*, & *Antimonium Diaphoreticum*. Of *Iron* or *Steel* is made *Regulus martis*, which preparations so named, are nothing but their bodies Chymically opened, calcined, and melted by *Nitre*. By *Nitre* also is *Tartar* calcined, by taking equal parts of *Tartar* and *Nitre* powdered,
and

and having put them into a Crucible, set fire to them with a red-hot Iron, stirring them continually till the Nitre be consumed, and evaporated, and the Tartar calcined, which you shall know by the ceasing of the burning. Thus, the Tartar being perfectly calcined, will afford you a salt as white as snow, by this method the Tartar is easier and sooner calcined than by the naked fire, Potter, or Glass-makers fire. And which so prepared, is commended not only for an excellent Medicine it self, it being *aperitive*, *deoppilative*, and *diuretick*, but serveth for the preparation of many excellent Medicines, as for the extraction of vegetable *Tinctures* without fire and precipitation of *Magisteries*, and other preparations, it being a *Catholick Precipitator*.

2. The Use of Nitre in Sublimation.

By which *Mercury*, or *Quick-silver* is sublimed, and so is made *Mercurius sublimatus corrosivus*, & *dulcis*.

3. *The Use of Nitre in Dissolution.*

And thus *Nitre* is used, either as it is distill'd it self into a spirit, or, as it is a chief ingredient in *Aqua-fortis*, *Aqua-Regis*, by which are dissolved all Mettals.

But to a little more particularise, by *Mercury* so dissolved and prepared, is made *Turbith Minerale*, *Mercurius precipitatus albus & ruber*. Of *Antimony*, *Sulphur aureum diaphoreticum*. Of *Mercury* and *Antimony*, *Mercurius vita*, *Bezoardicum Minerale*; and also *Silver* and *Gold* are made potable by their proper Dissolvents, dissolv'd according to Art, and precipitated, which then will dissolve in spirit of Wine. After which manner, by three or four repeated dissolutions in *Aqua-Regis*, and precipitations with Oyle of Tartar, *Gold* will dissolve in spirit of wine, and tinge it with its yellow colour; and thus may be made that famous *Medicine* called *Aurum Potabile*. But for the processes of these Preparations, being in most Chymical Authors and Dispensatories, it is unnecessary

necessary here to repeat them ; and also for their Vertues, *Fides sit penes Authores.* And I should be too prolix, if I hunted too far every chace that riseth before me in this copious Forrest.

The Use of Nitre in the Great Elixir.

But *Nitre* is not only a chief agent in these preparations we have mentioned, but it may be also an operator in the *Great Elixir* that most sublime Experiment in Chymistry. But it may seem absurd to talk of the process of that which may be impossible, or never yet in being. Therefore the Learned Sir K. Digby in his Discourse of the *Sympathy powder* before he would give the reasons of such an Experiment, he thought it first absolutely necessary to perform the *quod sit*, that it was not only imaginary, but real, that the cure of a wound might be performed by sympathy, by Honourable and Learned witnesses, which cannot be performed by me in this Experiment, as will be easily supposed without such a protestation, I know-

ing nothing but by speculation, meeting with the Discourse and process of it in Chymical Authors. And the Argument against transmutation is so strong from the specifical difference of Mettals, that it is as possible for Vegetables and Animals to be changed one *species* into another as Mettals, so that unless convinced by an ocular Experiment there is reason to believe the contrary: yet the Authors which have affirmed it, are of such Reputation and Learning, that may induce one to the same belief.

If then one may be a Gueffer, It may be the *flying Dragon*, the *Bird of Hermes*, the *air flying over our heads*, that *moysture which reincrudates Gold*, the *Magnesia*, a *Place of Caria* antiently famous for *Nitre*, &c. by which, and other enigmatical names it seemeth to be vail'd in their Writings, that it might only be apprehended by the Sons of Art.

Thus it appears, that *Nitre* is the *Philosophical fire*, concerning which it is said, that *Vulgus igne cremat, nos aqua*: with which, according to the Chymical Art
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prepared, and used, the most fixed Metals are resolv'd into their principles, and their medicinal qualities made communicable to our bodies. *Nature* thus gratifying the *Physitian*, who is *Minister Nature*, her Servant, every Individual, and particularly this subject so variously serviceable in a *Medicinal Use*, which may require his expensive contemplative Courtships and Experiments.

The Philosopher having a double end in his Experiments, he doth not only respect the preparation of potent Medicines, but the improvement of his Intellect in the knowledge of Nature, *Cum scire est, per causam scire*. The *Philosophers Stone* itself would not make him perfectly happy, if he could not give the Reason of so lucrative a transmutation; and though we have purposely omitted the processes of these Chymical preparations, yet we shall endeavour to make a compensation with the Reasons of the admirable effects of this *Great Dissolvent of Nature*, in answering the following Question.

why Nitre and its distill'd spirit, Aqua-fortis, and Aqua-Regis, are so great Dissolvents ?

Those things are most difficult which are most excellent, and as nothing is more latent than the knowledge of Causes, so a Philosopher would count himself sufficiently happy in such an attainment, and in which his mind would rest satisfied. But I may not promise to gratifie my Reader with the knowledge of this Question, my reasons being more probable than demonstrative, but yet I prefer pleasure to policy, and would not blush to betray my ignorance by proposing a Philosophical Question, when by questioning and doubting, we may get knowledge.

If then I should say that *Nitre is dissolving* from its *piercing figure*, which is long like needles, and sharp, it might seem a pretty subtilty to some, not considering that figure is no active quality. We must therefore give other Reasons; as that,

This dissolving nature may flow from
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its *taste*, which is salt, and sharp; other things of the like taste being dissolving, as *Salt*, *Vitriol*, *Tartar*, *Vineger*, &c. especially their distill'd spirits.

And also from its *Inflammability*, which argues a *fiery* and *oily* nature, which are piercing, searching, and dissolving.

As *fire* dissolves and consumes every thing, and reduceth them into the four Elements, the principles of their composition, according to the *Peripateticks*, by which experiment they demonstrate their number and reallity; but the *fiery*, *airy*, and *watery* parts flye away, and being loosed, naturally tend to their proper places, thus set at liberty from their subjugating forms: the *fiery particles* ascend with their Eagle-wings above the upper Region of the Air, but the more visible *airy* parts rest in the middle way, between the more volatile *fiery* spirits, and the *watery* and *earthy*; the *aqueous humor*, though dried and turned into *smoak*, may be supposed to descend again to the place from whence the *Asbes* consisting of a *Salt* and *Caput mortuum* never were removed. But
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the *Peripatetick* sheweth himself a *cruel & careless* Philosopher, who would know nature by her destruction, and then take no care of her dead body; like the Tyrant *Nero*, who would see *Rome* thus dissolved and turned into Ashes, whose pleasure was in this doleful Experiment, not caring for its restitution, unless like the *Phenix*, it could rise again out of its own ashes: or like the *Anatomist* making a dissection into a living body to see the circulation of the blood, though his momentary curiosity tends to the cessation of the motion, and death of the Animal: When, on the contrary, the no less *inquisitive* but *merciful Chymist*, though beautiful, but sullen nature will not unveil her self but by compulsion to her Courtiers; he will not, like the *Platonick Lover*, contemplate only the outward shape and unknown Ver-
 tues, but will make her prostitute her self, yet they expose her not to the open fire, but in a Still, and is as careful to preserve her separated parts in a Receiver, so worthy an after contemplation, and to make requital, is yet studying and experimen-
 ting

ting to restore the same body by a reuniti-
on of the disjoyned parts. Its inflamma-
bility also argueth an *oily nature*, which is
penetrating and dissolving, as also are all
Gums, Oiles, and Fats, &c. which easily
penetrate the body, dissolve gross humors,
and hard tumors. And especially artifi-
cially distill'd Oyles and Balsoms, as *Ole-
um benedictum Philosophorum, Balsamum
Petri Aponensis, &c.*

If these Reasons will not satisfie, I know
not whether to flye but to its *first cause*,
and so attribute this quality to its *Nature*,
which is both *matter and form, & princi-
pium motus, & aliarum qualitarum*, and
all these joyned together, make a subor-
dinate concatenation of causes, and a per-
fect demonstration. That it is *dissolving*
is experimentally known, and the *cause*
which is only in disquisition must come
from its *Nature and Properties*, which be-
ing no other than what we here, and in the
1 Chap. have declared, they may be said
to be the Causes of this dissolving proper-
ty of *Nitre*, thus *Aristotelically* demon-
strated; but let this be said with submis-
sion

sion to better Judgements, and to a more rational Philosophy.

The Use of Nitre in the Great and Noble Art of Artillery.

The admirable variety of this subject both in its Theory and Practise, hath entertained the Reader hitherto with no less pleasure than profit. And here the *Scene* is again chang'd; for what before was so pleasant in its Philosophical Contemplation, is here so dreadful, and what was so salutary in its Medicinal effect, is here so Mortal, and like a *Tragical Plot*, produceth a stupendous and fatal conclusion, as it is used in making that *Fiery Powder*, called *Gun-powder*, which is now to be discountis'd of. In which *Nitre* is the chief Ingredient, though it be compounded also of *Sulphur* and *Charcoal*; and as *Nitre* beareth the greatest proportion in this Composition, so from it proceedeth all the force, as being the *Anima Pyri pulveris*. From which wonderful Invention,

Ars magna Artilleria, or the Great Art of Artillery had its Original, and which is the *Primum Mobile* in the whole Art, all other Inventions of War being for the Use of this. The *Navigator* might better fail in the Vast Ocean to his desired Port without the *Needle* touch'd with the *Load-stone* in the *Compass*, than the *Souldier* do any Execution without this *Powder*: his Great Guns would be but dead bodies, and no more dreadful, were they not animated with this *Nitro-sulphureous Spirit*. Which neither the old *Romans* heretofore the Monarchs of the World, and famous for their Invention and Use of Arms, nor *Grecians* knew; not to recount farther back, but rather to lament the past *Golden Age* without hopes of returning, till the *Chymist* can transmute *Iron* and the other *baser Metals* into *Gold*.

Here we may consider not without admiration, how all other Inventions of War, which had been brought to such perfection by so many succeeding Ages, should all be disus'd, and vanish at the sight of a *Gun*, except the *Sword*, which is

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wore as much for fashion as use, a *Pocket-Pistoll* being preferr'd to it for security. The Weapons at first were natural, viz. *Arms* and *Legs*, wherewith Nature had furnish'd every man for his own defence, rather than hurting another: then they proceeded from *Clubs* to *Swords*, and all other Instruments of War, which yet were but the *Præludia* or *Skirmishes* to *Pyrotechny*, which hath been so powerful, that it hath raised a *Fist Monarchy*, The *Roman* yielding to the *Fiery*: so that *Germany* as it now triumphs in *Empire*, so in *Arms*, the Inventor being a *German Monck*, or *Chymical Philosopher*, who was a compleat qualified person, in whom there was such a consociation of *Arts* and *Arms*; concerning whom there are two Questions yet undecided. 1. *whether he is more to be praised or dispraised?* 2. *whether more good or ill hath proceeded from this Invention?* But it hath been doubted whether so ingenious and dreadful a *Machine* could be a humane Invention. Which, when it was first published, the World thought she had lost all her strength; for what more

terrible or violent could humane Wit invent to its own destruction, than this *artificial Lightning* and *Thunder*.

Let us imagine so many *Mars's* or *Hercules's* of Antient times, who so undauntedly stood to their Arms; if they now saw the *artificial Lightning*, and heard the *Thundring Noise*, and experimented the *Power* of our *Guns*, they would presently be amazed, and quake for fear, and be heartless, and would fall down dead at the force of our *Five-Arms*; when we blow up Houses, break down Castles, yea, Remove Mountains, and what not. When we can kill so many with it in a moment, and at a distance, without endangering our selves with this *Artillery of Heaven*. *Perdidisset olim nullus dubito Jupiter Imperium, & collapsis Olympi manibus cessisset; si Gigantes talibus instructi Armis, contra eum belligerassent.* - *Cassim. Siem.*

And as this is the last war-like Invention, so it is like to be, being not to be imitated or excelled, equalling the other famous Inventions of this last Age, as *Printing*, and the *Compass*, with which this is usually reckon'd. It

It would take up a great volume to discourse of the *Great and Noble Art of Artillery*, which I cannot pretend so much to the knowledge of, and should detract from those Honourable and Experienced Authors and Professors, who have so well merited on the subject, as if they had been deficient. We shall also refer the *Art of making Gun-powder* to the Artificers themselves, who may better satisfy the curious Reader; but before we leave this subject, we shall give *the Reason of the composition and power of this fiery powder*, as belonging to a Philosopher and our present Discourse.

*The Rationality of the Admirable
Composition of Pulvis Pyrius, or
the Fiery Powder called Gun-
powder, and of the Use and Of-
fice of every Ingredient.*

IT was not casually, or by chance, that this *Fiery Powder* was found out, but by superlative Reason, and the greatest knowledge in Natural Philosophy, which this sufficiently proveth, because since its first Invention to this very day, none could invent the like, or propose three other substances, which being mixed and incorporated together, could make a Fire so quick, vigorous, potent, dreadful, and not to be extinguish'd till wholly consumed.

The Rationality of which Invention will appear, if we consider the *Nature* and *Use* of every Ingredient in the Composition of this *Powder*, viz. of *Nitre*, *Sulphur*, and *Charcoal*.

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From

From the *Sulphur* it suddenly takes fire, which being its natural food, is immediately kindled by the touch of fire, and being mix'd with *Nitre*, it inflames it; but *Nitre* burning, resolveth it self into so great a vapour and smoak, that being mix'd with *Sulphur*, and kindled suddenly by it, it would quickly extinguish the flame of the *Sulphur*, and consequently go out it self; and therefore if there were a powder made of these two Materials, *Nitre* and *Sulphur*, by fire they would presently burn, but for the former Reason would be as soon extinguished, and the whole matter would not be consumed before the going out of the fire, but only some part.

But this Defect is supplied by the addition of a certain proportion of *Charcoal* to these two Materials, which *Coal* likewise immediately upon the touch of fire burneth, yet without flame; and this fire the more it is blown, it is the more increased, and so preserved till it is all burned, and turn'd into Ashes. Wherefore, when this powder is prepared of a mixture

mixture of these three combustible substances, and so intimately mix'd and united in the Artificial making of it, are all kindled by the touch of an Extraneous fire, of Match, or other live Coal, and also fire one another; for when the *Sulphur* is contiguous to the fire, it takes flame immediately, which doth not only introduce a fire with a flame into the *Nitre*, but also in the same moment fires the *Coal*, which cannot be suffocated or extinguished by the airy Exhalation of the *Nitre*, but on the contrary, the more encreased, and so is produced a momentaneous and inextinguishable fire in this composition so rationally and artificially compos'd.

From what hath been said we may conclude, that the office of the *Sulphur* in *Gunpowder* is, that it may suddenly take fire & flame, and to communicate it the quicker to the *Nitre* and *Coal*.

But the peculiar office of the *Coal* is in retaining, conserving, and defending the fire already introduced into the *Sulphur*, lest it should be smothered and extinguished by the vehement airy Exhalation of

the Nitre: and moreover, as I may add,

The Coal keepeth the Nitre very dry, that it may not relent and moisten by the Air, which, like other Salts it is subject too, and so keeps it alwaies rightly dispos'd to burn, which is a Reason I have not observ'd from any. For the Coal being a burn'd body, and all the Crude moisture gone, it attracteth to it self (like other calcin'd bodies) all the moisture which may be caused by the Air or Weather, notwithstanding it be barrell'd up, and kept very close, and dryeth it up. This I could prove from many other Experiments, But I shall only mention, that if you will keep Salt, flour of Wheat, Roses, &c. dry in a pot, and so preserve them a long time, it may be effected by putting some whole pieces of Charcoal amongst them, which is no common Experiment, which will preserve the Salt from relenting, and the Meal or Roses, &c. from growing musty, by attracting to it self, and drying up the crude moisture, which causeth a putrefaction. And so in this Composition of Gun-powder, if it would burn, and go off as well without the addition and
mixture

mixture of Coal, yet this Nitro-sulphureous Powder would be often indispos'd by moisture, & the best Repository would not preserve it without this : so that this Coal doth not only preserve the fire from going out, and continues it, but is a Repository for the Nitre and Sulphur, which keeps them alwaies dry, and rightly qualified to go off in a flame and smoak.

But the office of the *Nitre* is suddenly to produce a great airy exhalation, in which all the force of this Powder consists, and is therefore the *Basis* of the Composition ; and as it is in the greatest quantity, so it is the only and principal cause of the great and wonderful Effects of this Powder ; the other two substances being to excite the burning quality, and correct the moisture of the *Nitre*, that it may be alwaies qualified, and may in a moment go off in a flame and smoak: no otherwise than the Physician in his compositions doth not only excite the vertues of the *Basis* of his Medicines, but correct the ill qualities.

Now ; that *Nitre* is the *Anima pyrii pulveris*, or soul of this fiery Powder is from hence apparent ; for if any one should make a Powder only of *Sulphur* and *Coal*, and should charge a *Gun* with it, it would be so far from sending out a *Bullet*, that it would not blow away *Chaff*, because all the force and Expulsion proceeds only from the *Nitre*. In the Room of which, nothing in *Rerum Natura*, in the three Families of Nature can be substituted, as could be demonstrated by enumerating their species and properties. But two other substances may be found to supply the use of *Sulphur* and *Coal* in this composition, as I could instance, though none more convenient or better than these two together suddenly to catch and retain a fire and flame, that all the *Nitre* may in the same moment be inflam'd, and that from it may proceed so vehement an airy Exhalation, the Effector of those wonders in *PYROTECHNY*.

Thus, we have seen the Reason of this to be admir'd war-like composition, which is so rationally compos'd, that nothing

thing can be added or detracted from it ; and also it is so artificially made, did I but set down the Mechanism of it, that it conduceth almost as much to it, as the quantity and proportion of the Materials; the three substances are to be refin'd, and brought into most fine powder, and mixt; and by beating so incorporated, that in the least Corn there is all the Ingredients according to their proportion. Now, here I could particularly discourse of the Rationality of the Artifice it self, how by beating so long a time, the bodies of all the Ingredients are so opened, that though they are so combustible in themselves, yet they are rendred thus the more inflammable, as that upon the least touch of fire they go off into a flame: And I should enter into a large discourse if I should set down all my thoughts on this subject, from which many Philosophical secrets may be understood; but I am afraid my Reader may be already satiated at this time, and more varieties *conjunctim* may not be so grateful; and indeed they may be more than ordinary secrets that I do not unwilling-

willingly reserve them : but not altogether to Tantalize my Reader, I shall really satisfie him with the Reason of the Granulation of this Powder, by which it is more forcible, *Pulvis enim pyrius granulatus plus virium & Effectus habet quam in pollinem redactus.*

why Gun-powder is granulated?

The only Reason of which may be this, this Powder after it is so well powdred and beaten, and brought into small atoms, it is granulated and reduc'd into larger corns, that the Powder may lye hollow, that the *Radii ignis*, or fire, may by the air be carried to every part, and touch it, and so in a moment the whole body may be fired; in which momentaneous explosion of the whole quantity all the force consists; but if it should be in flour, or fine powder, the fire by the touch would not so soon penetrate every part lying close, and no vacuties or airy places for the fire to be carried, and touch every part at the same time, and so goeth off the more lea-
surely

surely, and not with so great a force.

The Reason of the Great Power of Gunpowder.

It is from the peculiar Nature of *Nitre*, that it is so burning in *Artificial Fire-works*, which are made especially for *Recreation*, and *publick Expressions of Rejoycing*, by which the two most Excellent Senses, the Eyes and Ears are very much delighted with the *fiery Figures* which are represented; and *pleasant Sounds* which proceed from them; in the making of which, no small Art is shewn; and are the recreative Diversions of the Professors of the *Art of Artillery*.

But, as it is thus compos'd into this admirable and compleat Invention of *Gunpowder*, its Nature and Qualities are greatly improved, and far surpasseth its *Inflammability*, and let not the Chymist brag of his *Spirit of Nitre*, or *Aqua-fortis*, this *dry Spirit* far excelling his *moyst*, which may be said to be phlegmatick and dull to this; whose force proceeds

ceeds from being suddenly fir'd, and in a moment turn'd into Air, which then requiring a far greater space, which on a Natural necessity it must have (a place belonging to every natural body, of which it is a proper affection, according to the Philosopher) and so a Gun charged with it, it so violently sendeth forth the Bullet, or breaketh the Gun, then followeth a terrible thundring Noise, which proceedeth from the sudden and violent explosion of the Powder, and breaking of the Air.

The Mechanical Uses of Nitre.

A Liquor having dissolved so much common Salt as its body will contain, what more is put into the Glass, will fall whole to the bottom undissolved; but yet this water, though already fully impregnated, is capable of receiving a quantity of Salt of another Species and Figure, though it will precipitate more of the same; not unlike to a Stomach satiated of one sort of Meat, yet with pleasure and appetite will receive another: and no otherwise our
Subject,

Subject, which, though it seem'd wholly devoted to the service of the Physitian both in his *Galenicall* and *Chymical Experiments*, yet it hath been capable of another Employment, in furnishing the Souldier with his *Artillery*, in whose service also it exerts all its powers; yet it hath still a reserve, And, as a Great *Prince*, which doth not only gratifie his Favourites and Courtiers, but respects his meaner Subjects: So *Nitre*, though it chiefly favour the *Philosopher* and *Souldier*, being so great a promoter of *Arts* and *Arms*; yet there are some *Mechanicks* not so inferior to be disrespected, to whom it is not a little serviceable, as *Refiners* and *Dyers*; in which Art of *Refining* it is used for dissolving and separating Silver from Gold; and in the Art of *Dying* it is used, especially in the *Bow-dye*. But if you would with my Lord *Bacon* outcant these or other Artists in their own Terms, and be as skilfull in their Arts, I must refer you to the Masters themselves.

The Use of Nitre and its Salt, in Cookery.

It is also a pretty *Mechanism* in *Cookery*, which I shall set down to pleasure our English Ladies delighted in such Experiments, which is this,

Nitre giveth a *Red Colour* to Neats-Tongues, Collard-Beef, Bacon, or what other *Meat* you will have look *red*, for which purpose the *Salt* is most used, which is separated in the Refining from the *Nitre*, but that being scarce to be had, and that you may not lose your Experiment, you may please to use the *Nitre* it self, by mixing a small quantity with the other *Salt*, with which you salt your meat, and it will tinge it with this desired *red colour*, and add to it a more savoury taste, and so both inviteth and pleaseth the appetite.

Thus we have made a compensation of our more barren Theory with the useful Practise of Nitre ; and here we may judge of the difficulty of the knowledge of Nature in General, not only from the great Variety of its Species, but the abstruse Nature of every Indi-

Individual, as may appear from the Subject of
 this Treatise, which we have declared,
 though veiled under so many ænigmatical
 Names, and so obscure and various in its
 Nature and Use. And knowing little
 wanting to the completing of this Discourse,
 we may put to it an End.

F I N I S.

THE
Natural History
OF
NITRE:
OR, A
Philosophical Discourse
OF THE
*Nature, Generation, Place, and Ar-
tificial Extraction of* NITRE,
WITH ITS
Vertues and Uses.

BY
WILLIAM CLARKE.

LONDON;

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Exchange, 1670.



nual scrutiny they have not left the most minute or secret wheel of Natures *animal Clockwork* undiscovered; so, neither the uses of the parts they have been so fortunate in the discovery of, are hid and obscured; as there is no *terra incognita* in the *Microcosm*, so 'tis all improved: the external form of a Plant hath not satisfied the *Herbalist* without examining its Vertue; which, if it hath not been sufficiently manifested to the outward senses, it hath endured the fiery tryal, which hath made Minerals as well as Vegerables confess all their treasures to the Experimental Philosopher.

And our Labour, if we will imitate these our great Masters, is not yet done, if we declare not the Vertues and Uses of that *Nitre*, which we have hitherto Physically contemplated; which being so excellent and various, is matter enough for the continuance of our Discourse. For this is a subject not only for contemplation, but practise, and we could hardly forbear till now in the last place to mention them, when this Chapter might have preceded the

the former, for the greater invitation and encouragement to the reading of them. For otherwise the Philosopher would not only be ignorant of one *species* in Mineralogie, but of the reason of many natural *Phainomena*, which by the knowledge of *Nitre* are demonstrated. The *Galenist* would not rest without the knowledge of that Medicine good for so many Diseases, as also the *Chymist* would presently study, and covetously extract that which must be his chief *Menstruum* in his preparations. The *Divine*, without the knowledge of this, would lose one of his *Criticks*. The *Artillery-man* or *Souldier* could not stand his ground, and in comparison, would march unarm'd into the field without these fire-arms, and without it many Mechanicks would be undone: its use being so universal and unconfined, both for speculation and practise.

And first we shall shew the *Vertues* and *Use* of *Nitre* in *Medicine*, both *Galenical* and *Chymical*, which Medicinal use followeth the Philosophical Discourse from a natural order; Medicine being a subalter-

uate Art to Philosophy: *ubi igitur desinit Philosophus, ibi incipit Medicus.*

*The Vertues of Nitre in Galenical
Physick.*

We come now therefore to treat of it as it belongs to the *therapeutical* part of *Physick*, and as it is a *materia medica*, and accordingly its *first* and *second qualities* are to be considered, which in the first *Chapt.* we referr'd to this place.

It is not a little controverted whether *Nitre* be *cold* or *hot*, & reasons as probable on both sides, as it hath been disputed concerning *Camphor*, *Opium*, &c. But not to enter into a controversie, but rather decide it, we say, that it is *cooling* in the concrete, not cold in the abstract, and that so sensibly, that it may be placed in the *second degree*, and so whether it be cold or hot, it will confirm our opinion, if the first, *viz.* cold, we need no proof, that it is cooling; if the second, *viz.* hot, it may be cooling *per accidens*, though not *per se*, or in effect, by taking
away

away hot humors, and so the body may remain more cool by such an operation. No otherwise than hot Medicines cure burnings, as *Oyle, Onyons, Soap, &c.* and for this seeming mixture of Natures, it hath been called *Sal Androgynus*, or the *Hermaphroditical Salt*: and its nature being so obscure, we would not be more positive in our determination, yet we may undertake to answer on the Question with the former distinction.

Neither is *Nitre* thus singly endowed with the *first*, but also with other *second* and *third qualities*, it being moreover in its nature *resolving, purgative, and diuretical*. It being so compleatly qualified, that there seemeth nothing wanting to its perfection.

And from these properties it is in use by *Physitians*, for those Diseases to which it is appropriated, they being no less diligent in the use of Medicines than in the investigation of their natures. From its *first qualities*, *Nitre* being so great a cooler, it is used in *Fevers*, to extinguish the heat and dryness. From which effect it is called

led *Lapis Prunellæ*, because it is a sovereign remedy against those *Fevers* which in French are called *Fieures prunelles*, or *Burning Fevers*; and this from the Latin word *pruna*, which signifieth, a live or burning coale, which is the common *Nitre* better prepared and purified, and is not only called so from its vertue *prunellæ*, but from its preparation, by which it is hardned *lapis*. The preparation of which *Lapis prunellæ* is after this manner;

Take 1 pound of pure resin'd *Nitre*, put it in a crucible, or other Vessel on a very hot fire, that it may melt and flow like a mettall, then put to it, thus melted, two ounces of flower of Brimstone by little and little, which will immediately take flame and burn, and when it is all consumed, pour off the *Nitre* into a brass Basen, and after it is cold, let it be kept in a glass close stop'd for use.

Now this is the highest purifying of *Nitre* that may be, which excells the resin'd *Nitre*; for if there be any heterogenous substance, or crude moylture in it, it is thus consumed and evaporated by the flame of the *Sulphur*; which may have
occa-

occasion'd the other name of *Cryſtallum minerale* to be given to it from its purity. *Medicines*, as well as *Persons*; thus glorying in their *Titles* deservedly and honourably conferr'd on them, the *Phyſitian* here imitating a *Princely Prerogative* in conferring *Honorary Titles* on his Preparations.

And here we may obſerve how curious the *Galenist* is in preparing his *Medicines*, though the contrary without cauſe is too often objected. The beſt refin'd *Nitre* is not fit for his turn, till he hath by Art thus purified it: but his wiſdome alſo is not a little in reſting here, and not proceeding any farther by diſtilling it into a ſpirit, its *Vertue* ſhewing it ſelf better as it is, and it may ſeem but a labour in vain, when if it ſhould be ſo prepared, before he could exhibit it as a *Medicine*, he muſt reduce it back again into its former ſtate by dilating it in common or ſimple diſtill'd water, or ſuch like liquor, that it may not be too corroſive and piercing, it being then a fitter *Menſtrum* or *Preparator* of *Medicines*, than a *Medicine* it ſelf.

But, though it be so particularly good for a *Fever*, it is not confin'd only to that in its use, but for the same Reason also its use is more general. For a *Fever* proceeding or accompanying most other Diseases, it is also good for them, and from its *second* and *third qualities* it dissolves and carries away by stool and urine hot, sharp, cholerick, and obstructive humors in several parts of the Body, which give names to several Diseases, which preternatural humors causing pain, and thus taken away, it is called *Anodynum minerale*.

Neither is its *Use* only *internal* but *external*; for the same hot and sharp humors in *Waters*, *Oyles*, *Unguents*, or *Powders*, as the Learned Artist pleaseth.

Now here I could particularly set down how *Nitre* was used by the Antient Galenists, *Greeks*, *Arabians*, and *Latins*, both singly, and in composition, inwardly, and outwardly, and how we vary in our modern practise. But the Philosopher may not so much desire it, and the Physitian may already know it, & *artis est celare artem*, and shall therefore defer it till another opportunity,

portunity, when I promise with what is thought fit now for brevity to be omitted, fully to satisfie my Reader.

Now here I am opposed with a *Dilemma*, whether I shall continue my Discourse, or interpose a Philosophical Question, which ariseth from this preparation of *Lapis Prunellæ*; but to deviate sometimes, is to walk out of a plain path into a flowry Meadow, and I may more consult my Readers pleasure by this Diverſion, therefore I shall here propose this Question.

Why in this preparation of Lapis Prunellæ, the Nitre doth not burn, but only dissolve, and boyle in the Crucible?

This being the most inflammable substance in the World, nothing could give a better occasion to the Question. Which yet is no other than what hath been proposed by many Philosophers in other words; As, *why the bottome of a Pot over the fire, in which the water boyleth, is not red hot?* And there is the same reason

son for this as the other, and it is the same with many other Questions; As, *why Pewter and Leaden Vessels which are easily melted by the fire, do not melt as long as there is in them water, or any other liquor; neither will Earthen Vessels flye, and break?* After the same manner *Water or Oyle may be heated in a paper over the fire, and the paper not burn:* and many other such like Questions, which have been thought worthy the Exercise of the wits of many Philosophers. Many of whose opinions on this Question, the Learned *Sennertus* hath collected, and at last gives his own Reason, whom the Reader may please to peruse, and as the others were not satisfactory to him, or a mind desirous of truth, so neither are those, nor his own to me; and therefore I shall give another, which seemeth to me to be the only true, and I hope may be so fully satisfactory, that it may put an end to the Question.

In answer to the Question, I say, that the *Nitre* in the Crucible, or other Vessel, doth only dissolve and boyle, but not take flame and burn, because that the Crucible

or

or Vessel it self cannot be red-hot, and burn, so far as it is fill'd with *Nitre*, so as to kindle the *Nitre*, and the Reason is for want of *Air*: For *Air*, being the life of Fire, the *Nitre* dissolving in the Crucible, or other Vessel, keeps out the *Air*, and so both preserves the Vessel and it self too; so if *Oyle*, &c. should be put on the fire in a Pewter or Leaden Vessel, they would be both hot, but as the Vessel would not melt, so the *Oyle* would not burn, but if you put a live coal into the Crucible, the *Nitre* immediately flameth, because it hath the free *Air*; and so the *Oyle*, if the flame of the fire should touch it at the top of the Vessel, it would likewise take flame, and burn: and on the contrary, these Vessels would be red-hot, crack, and melt, were they put on the fire empty.

This Question puts me in mind, walking in the Ruines of the City after the Fire, on the Gold on many Statues and other places which were guilt, which was not melted, though the stones endur'd the most scorching flames, because it sticking so close, no air could come about it,
that

that unless the stones did burn and melt, the Gold would remain undissolved : but that which one may more wonder at, not knowing the Reason was, that the paper-Bills on the walls in many places where the fire came, where they were pasted close, and no hollowness, for there they were burn'd, remain'd like the Gold unburn'd, and endur'd that fiery Tryal. I then observing it, put me in mind of the Question, and I ask'd one which stood by me, whom I took not for a Philosopher, was it not very strange that those paper-Bills on the walls should not be burned ? he answered, 'twas very strange that the fire should not touch them, the wall and places all about being burn'd ; I answered, the fire touch'd them as vehemently as any other part of the wall, which when he considered, did the more wonder. Thus many other like Questions are truly resolved, and other secrets of Nature understood, which we shall not now mention, lest our variety should be tedious.

But

But yet we cannot proceed, being detained with another Question in this preparation of *Lapis prunellæ*. *Why the sulphur which immediately takes flame and burns on the top of the Nitre, doth not inflame the Nitre, no more than the fire underneath?* It being not to be kindled by a flame, but a glowing coal, &c. But to answer every Question, might be too Magisterial, and suspicious of the Readers Ingenuity; I shall therefore purposely leave it unresolved, to remain a Philosophical Recreation.

A Philosophical explanation of those places in the Sacred Scriptures, in which Nitre is named.

Natural Philosophy, as well as the other parts of the *Encyclopædia*, doth not a little contribute to the understanding of the *Sacred Scriptures*, as hath been manifested by several Authors, who are deservedly numbred amongst the *Critici Sacri*, who have wrote of the Animals, Vegetables, and Minerals named in them.

And

And in imitation of these Divine Philosophers, having in the Second Chap. interpreted those places in the *Bible* in which *Nitre* seemeth to be understood by the names of *Fire* and *Salt*: we come now, to explain those places in which *Nitre* is expressly named.

We read of נִתְר *Heb.* or *Nitre* in *Prov.* 25. v. 20. *As he that taketh away a Garment in cold Weather, and as Vineger upon Nitre, so is he that singeth songs to an heavy heart.* *St. Hieronymus, Lyranus, Isidorus, Valesius, &c.* have variously commented on this word *Nitre* in this place, as may be read in *Cæsius de Mineralibus*. But my Interpretation being different from the fore-quoted Authors, shall be here set down, and which seemeth to be the natural meaning, which is this.

Nitre being of a very cooling, and sharp taste, and *Vineger* being known to be of the same nature; therefore, as *Nitre* is used in *Fevers*, so is *Vineger*; so that one being mix'd with the other, the nature of both is exalted and encreased. By which this *Nitrum acetosum, vel Acetum nitrosum,*

or

or *Nitre dissolved in Vinegar*, is more cool and sharp by this conjunction, as *he that*, on the contrary, *taketh away a Garment in cold weather*, encreaseth the cold: as it is in the former part of the *Verse*, by which we may understand the later part of the similitude, viz. *so is he that singeth songs to an heavy heart*, that is, he doth but encrease his sorrow by the best *Musick*, which is *Vocal*, expressing words in a melodious *Air*, as proceeding from the best *Instrument* composed so artificially, though a natural organ, of so many parts for the framing the voice, and playd upon by the animal spirit, the immediate instrument of the *Rational soul*, when all other *Instruments* of *Musick* may be said to be dead to this lively one; yet this hath a contrary effect to a sorrowful mind. Speech sheweth a man, he not being known so well by his outward *Physiognomie* as *Discourse*, which is set forth the more by the delivery; but, as *Verse*, for mirth, hath the advantage over *Prose*; so, when it is set to a tune, and sung, what *Musick* can be compared to it, either in nature, or effect. Yet this

to

to a melancholy hearer, is but like the pleasing *Berry* of *Dulcamara* or *Bittersweet* to the palate, which first tasteth sweet, but afterwards turneth bitter. How ineffectual would only good advice or some comfortable expressions be, if a *Song* would but exasperate the Humor. If honey thus breedeth Choler, & Sweetmeats turn into bitter humors. Here *Corruptio optimi est pessima*, a Cordial doth but evaporate the spirits, which should increase them: no otherwise than *Atrabilis Ventriculo substrata*, or the melancholy humor it self, which doth but the more ferment and boyl by the best meats, and convert them into its own sour nature, & so increaseth it self; it is dangerous to attemperate, much more to purge this black cholerick humor, & hence those diseases which proceed from it are so difficultly cured.

We read of *Nitre* also *Jer. Chap. 2. v. 22.* For though thou wash thee with *Nitre*, and take thee much soap, yet thine iniquity is marked before me, saith the Lord God. *Septem sunt species, quæ auferunt maculas apud Talmudicos, inter quas est, מֶלַח, vel Nitrum,*

Nitrum, according to *Buxtorfius*. *Lyranus* commenting on this place saith, *Nitrum, quo utuntur purgatores vestium, dicitur a niteo quia facit vestes nitidas*, and according to *Dr. Jordan*, if *Nitre* be mix'd with earth, it makes it abstergent, like soap, and this scouring faculty of *Nitre* was anciently known, and used in *Bathes*, &c. and is worthy again to be brought into use, its Vertue being admirable for cleansing the skin from such humors which discolour and fret it.

The Use of Nitre in Chymistry.

Thus, having expressed the Vertues of *Nitre* in Galenical Physick, we now come to its Uses in Chymistry, which are no less excellent than various. For, by *Nitre* in Chymistry may be made a pleasant and cooling acid, or a hot and burning corrosive: sometimes it revives the vomitive and purgative vertue of *Antimony*, sometimes it kills the vomitive, and revives only the purgative, and sometimes it destroys both, and quickens either the *Di-*

F
retick,

retick, or *Diaphoretick*; in a word, it produceth so many wonderful effects upon all the other Minerals, that we may justly call it the *Universal Agent in Chymistry*. As the experienc'd Mr. *Thibaut* Chymist to the *French King*, expresseth it.

And after a serious and exact consideration of most Chymical preparations, its Use may be comprehended in this Division, *viz.* that it *Calcines*, *Sublimes*, and *Dissolves Minerals* and *Mettals*, which we shall in order declare.

I. *The Use of Nitre in Calcination.*

By *Nitre* is calcined *Sulphur vivum*, & so prepared according to Art, is called *Nitrum sulphuratum*. Of *Antimony* calcined by *Nitre*, is made *Regulus Antimonii*, *Crocus metallorum*, & *Antimonium Diaphoreticum*. Of *Iron* or *Steel* is made *Regulus martis*, which preparations so named, are nothing but their bodies Chymically opened, calcined, and melted by *Nitre*. By *Nitre* also is *Tartar* calcined, by taking equal parts of *Tartar* and *Nitre* powdered,
and

and having put them into a Crucible, set fire to them with a red-hot Iron, stirring them continually till the Nitre be consumed, and evaporated, and the Tartar calcined, which you shall know by the ceasing of the burning. Thus, the Tartar being perfectly calcined, will afford you a salt as white as snow, by this method the Tartar is easier and sooner calcined than by the naked fire, Potter, or Glass-makers fire. And which so prepared, is commended not only for an excellent Medicine it self, it being *aperitive*, *deoppilative*, and *diuretick*, but serveth for the preparation of many excellent Medicines, as for the extraction of vegetable *Tinctures* without fire and precipitation of *Magisteries*, and other preparations, it being a *Catholick Precipitator*.

2. The use of Nitre in Sublimation.

By which *Mercury*, or *Quick-silver* is sublimed, and so is made *Mercurius sublimatus corrosivus*, & *dulcis*.

3. *The Use of Nitre in Dissolution.*

And thus *Nitre* is used, either as it is distill'd it self into a spirit, or, as it is a chief ingredient in *Aqua-fortis*, *Aqua-Regis*, by which are dissolved all Metals.

But to a little more particularise, by *Mercury* so dissolved and prepared, is made *Turbith Minerale*, *Mercurius precipitatus albus & ruber*. Of *Antimony*, *Sulphur aureum diaphoreticum*. Of *Mercury* and *Antimony*, *Mercurius vita*, *Bezoardicum Minerale*; and also *Silver* and *Gold* are made potable by their proper Dissolvents, dissolv'd according to Art, and precipitated, which then will dissolve in spirit of Wine. After which manner, by three or four repeated dissolutions in *Aqua-Regis*, and precipitations with Oyle of Tartar, *Gold* will dissolve in spirit of wine, and tinge it with its yellow colour; and thus may be made that famous *Medicine* called *Aurum Potabile*. But for the processes of these Preparations, being in most Chymical Authors and Dispensatories, it is unnecessary

necessary here to repeat them ; and also for their Vertues, *Fides sit penes Authores.* And I should be too prolix, if I hunted too far Every chace that riseth before me in this copious Forrest.

The use of Nitre in the Great Elixir.

But *Nitre* is not only a chief agent in these preparations we have mentioned, but it may be also an operator in the *Great Elixir* that most sublime Experiment in Chymistry. But it may seem absurd to talk of the process of that which may be impossible, or never yet in being. Therefore the Learned Sir *K. Digby* in his Discourse of the *Sympathy powder* before he would give the reasons of such an Experiment, he thought it first absolutely necessary to perform the *quod sit*, that it was not only imaginary, but real, that the cure of a wound might be performed by sympathy, by Honourable and Learned witnesses, which cannot be performed by me in this Experiment, as will be easily supposed without such a protestation, I know-

ing nothing but by speculation, meeting with the Discourse and process of it in Chymical Authors. And the Argument against transmutation is so strong from the specifical difference of Mettals, that it is as possible for Vegetables and Animals to be changed one *species* into another as Mettals, so that unless convinced by an ocular Experiment there is reason to believe the contrary: yet the Authors which have affirmed it, are of such Reputation and Learning, that may induce one to the same belief.

If then one may be a Guesler, It may be the flying Dragon, the Bird of Hermes, the air flying over our heads, that moisture which reincrudates Gold, the *Magnesia*, a Place of *Caria* antiently famous for *Nitre*, &c. by which, and other enigmatical names it seemeth to be vail'd in their Writings, that it might only be apprehended by the Sons of Art.

Thus it appears, that *Nitre* is the *Philosophical fire*, concerning which it is said, that *Vulgus igne cremat, nos aqua*: with which, according to the Chymical Art
pre-

prepared, and used, the most fixed Metals are resolv'd into their principles, and their medicinal qualities made communicable to our bodies. *Nature* thus gratifying the *Physitian*, who is *Minister Natura*, her Servant, every Individual, and particularly this subject so variously serviceable in a *Medicinal Use*, which may requite his expensive contemplative Courtships and Experiments.

The Philosopher having a double end in his Experiments, he doth not only respect the preparation of potent Medicines, but the improvement of his Intellect in the knowledge of Nature, *Cum scire est, per causam scire*. The *Philosophers Stone* it self would not make him perfectly happy, if he could not give the Reason of so lucrative a transmutation; and though we have purposely omitted the processes of these Chymical preparations, yet we shall endeavour to make a compensation with the Reasons of the admirable effects of this *Great Dissolvent of Nature*, in answering the following Question.

*why Nitre and its distill'd spirit, Aqua-
fortis, and Aqua-Regis, are so great
Dissolvents ?*

Those things are most difficult which are most excellent, and as nothing is more latent than the knowledge of Causes, so a Philosopher would count himself sufficiently happy in such an attainment, and in which his mind would rest satisfied. But I may not promise to gratifie my Reader with the knowledge of this Question, my reasons being more probable than demonstrative, but yet I prefer pleasure to policy, and would not blush to betray my ignorance by proposing a Philosophical Question, when by questioning and doubting, we may get knowledge.

If then I should say that *Nitre* is dissolving from its piercing figure, which is long like needles, and sharp, it might seem a pretty subtilty to some, not considering that figure is no active quality. We must therefore give other Reasons; as that,

This dissolving nature may flow from
its

its *taste*, which is salt, and sharp; other things of the like taste being dissolving, as *Salt*, *Vitriol*, *Tartar*, *Vineger*, &c. especially their distill'd spirits.

And also from its *Inflammability*, which argues a *fiery* and *oily* nature, which are piercing, searching, and dissolving.

As *fire* dissolves and consumes every thing, and reduceth them into the four Elements, the principles of their composition, according to the *Peripateticks*, by which experiment they demonstrate their number and reallity; but the *fiery*, *airy*, and *watery* parts flye away, and being loos'd, naturally tend to their proper places, thus set at liberty from their subjugating forms: the *fiery particles* ascend with their Eagle-wings above the upper Region of the Air, but the more visible *airy* parts rest in the middle way, between the more volatile *fiery* spirits, and the *watery* and *earthy*; the *aqueous humor*, though dried and turned into smoke, may be supposed to descend again to the place from whence the *Ashes* consisting of a *Salt* and *Caput mortuum* never were removed. But the

the *Peripatetick* sheweth himself a cruel & careless Philosopher, who would know nature by her destruction, and then take no care of her dead body; like the Tyrant *Nero*, who would see *Rome* thus dissolved and turned into *Ashes*, whose pleasure was in this doleful Experiment, not caring for its restitution, unless like the *Phenix*, it could rise again out of its own ashes: or like the *Anatomist* making a dissection into a living body to see the circulation of the blood, though his momentary curiosity tends to the cessation of the motion, and death of the Animal: When, on the contrary, the no less *inquisitive* but *merciful Chymist*, though beautiful, but sullen nature will not unveil her self but by compulsion to her Courtiers; he will not, like the *Platonick Lover*, contemplate only the outward shape and unknown Virtues, but will make her prostitute her self, yet they expose her not to the open fire, but in a Still, and is as careful to preserve her separated parts in a Receiver, so worthy an after contemplation, and to make requital, is yet studying and experimenting

ring to restore the same body by a reunition of the disjoyned parts. Its inflammability also argueth an *oily nature*, which is penetrating and dissolving, as also are all *Gums, Oiles, and Fats, &c.* which easily penetrate the body, dissolve gross humors, and hard tumors. And especially artificially distill'd Oyles and Balsoms, as *Oleum benedictum Philosophorum, Balsamum Petri Aponensis, &c.*

If these Reasons will not satisfie, I know not whether to flye but to its *first cause*, and so attribute this quality to its *Nature*, which is both *matter and form, & principium motus, & aliarum qualitatum*, and all these joyned together, make a subordinate concatenation of causes, and a perfect demonstration. That it is *dissolving* is experimentally known, and the *cause* which is only in disquisition must come from its *Nature and Properties*, which being no other than what we here, and in the I Chap. have declared, they may be said to be the Causes of this dissolving property of *Nitre*, thus *Aristotelically* demonstrated; but let this be said with submission